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CALIFORNIA MINERAL PRODUCTION

AND

DIRECTORY OF MINERAL PRODUCERS

FOR 1945

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DIVISION OF MINES
FERRY BUILDING, SAN FRANCISCO

W. B. TUCKER — State Mineralogist

San Francisco] BULLETIN No. 137 [October 1946

CALIFORNIA MINERAL PRODUCTION

AND

DIRECTORY OF MINERAL PRODUCERS

FOR 1945

By
HENRY H. SYMONS

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LETTER OF TRANSMITTAL

To His Excellency, The Honorable Earl Warren,
Governor of the State of California.

Sir: I have the honor to herewith transmit Bulletin No. 137 of the Division of Mines, of the Department of Natural Resources, being the annual report of the statistics of the mineral production of California.

The remarkable variety, total values, and wide distribution of many of our minerals revealed herein show California's importance as a producer of commercial minerals among the states of the Union.

Respectfully submitted.

Warren T. Hannum,
Director of Natural Resources.

INTRODUCTION

It is the endeavor of the staff of the State Division of Mines (formerly State Mining Bureau), in these annual reports of the mineral industries of California, to so compile the statistics of production that they will be of actual use to producers and to those interested in the utilization of the mineral products of our State, while at the same time keeping the individual's data confidential. In addition to the mere figures of output, we have included descriptions of the uses and characteristics of many of the materials, as well as a brief mention of their occurrences.

The compilation of accurate and dependable figures is an extremely difficult undertaking, and the State Mineralogist takes the opportunity of here expressing his appreciation of the cooperation of the producers in making this work possible. A fuller appreciation of the value of early responses to the requests sent out in January will result in earlier completion of the manuscript. Statistics lose much of their value if their publication is unnecessarily delayed.

Some of the data relative to properties and uses of many of the minerals herein described are repeated from preceding reports, as it is intended that this annual statistical bulletin shall be somewhat of a compendium of information on California's commercial minerals and their utilization.

W. B. TUCKER,
State Mineralogist.

STATE · OF · CALIFORNIA
DEPARTMENT · OF · NATURAL · RESOURCES
DIVISION · OF · MINES
WALTER W. BRADLEY
STATE MINERALOGIST
OUTLINE MAP
OF
CALIFORNIA
SCALE
OREGON
SISKIYOU
MODOC
TRINITY
SHASTA
LASSEN
HUMBOLDT
TEHAMA
PLUMAS
GLENN
BUTTE
SIERRA
MENDOCINO
NEVADA
LAKE
COLUSA
PLACER
YOLO
EL DORADO
SONOMA
NAPA
AMADOR
ALPINE
SOLANO
CALAVERAS
MONO
MARIN
CONTRA COSTA
SAN JOAQUIN
TUOLUMNE
SAN FRANCISCO
ALAMEDA
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INYO
SAN BENITO
MONTEREY
VISALIA
TULARE
KINGS
SAN LUIS OBISPO
KERN
SAN BERNARDINO
SANTA BARBARA
VENTURA
LOS ANGELES
RIVERSIDE
ORANGE
SAN DIEGO
IMPERIAL
MEXICO
PACIFIC OCEAN
NEVADA

MINERAL INDUSTRY, CALIFORNIA, 1945

DATA COMPILED FROM DIRECT RETURNS FROM PRODUCERS IN ANSWER TO INQUIRIES SENT OUT BY THE CALIFORNIA STATE DIVISION OF MINES, FERRY BUILDING, SAN FRANCISCO, CALIFORNIA

CHAPTER ONE

The total value of the mineral output for California for the year 1945 was $473,661,591, being an increase of $3,887,066 over the 1944 total, which was $469,774,525. The increase was due to the unprecedented output of petroleum and natural gas. There were 58 different mineral substances, exclusive of the segregation of various stones grouped under gems, on the commercial list; and all 58 counties of the State contributed.

As revealed by the following, the salient features of 1945 as compared with the previous year were: The only group that showed an increase in total value was the fuels, although the total value was the largest on record. Mineral substances showing the greatest annual output as to amount and value were barite, diatomite, gypsum, lithium minerals, natural gas, silica (quartz and glass sand), soapstone, talc and pyrophyllite, and soda (soda ash and salt cake). Petroleum registered its greatest annual yield and zinc the largest annual value.

Of the fuels, petroleum increased from 311,717,804 barrels worth $330,659,802 in 1944, to 328,262,400 barrels valued at $342,756,767 for 1945, being an increase of 5.3 percent in amount and 3.66 percent in value. The 1945 output of crude oil was the largest on record but was exceeded in value by that of 1926 when the value per barrel was $1.538 compared with $1.044 in 1945. Natural gas increased from 467,743,258 M cubic feet worth $31,797,418 in 1944 to 538,273,934 M cubic feet valued at $35,362,313, which was the largest annual yield ever reported in the state.

Of the metals: An increase in annual value was recorded by gold, lead, silver, and zinc; all others showed a decline in amount and value from that of 1944. The value of the gold yield increased from $4,108,055 in 1944 to $5,177,830 and again passes all metals in point of value, it having been passed by tungsten ore and quicksilver during the war years. Copper decreased from 25,584,865 pounds worth $3,453,957 to 13,949,675 pounds worth $1,883,206. Lead increased from 11,408,381 pounds worth $912,670 to 14,504,767 pounds worth $1,247,410 which output was only exceeded by that of 1917. Quicksilver decreased from 28,097 flasks worth $3,178,969 to 21,062 flasks worth $2,697,835. Tungsten ore decreased from 203,965 units worth $4,835,810 to 71,511 units worth $1,587,951. Zinc increased from 16,456,103 pounds worth $1,875,996 to 19,340,732 pounds worth $2,224,184 and was the largest annual value of this metal.

Of the industrial nonmetallic group: The group as a whole decreased from $62,292,574 in 1944 to $59,695,692, which was chiefly due to miscellaneous stone, the total value of which decreased from $25,138,003

to $20,207,351. Most other important minerals under this classification registered gains in total value as bentonite, cement, pottery clay, diatomite, lithium minerals, pumice and volcanic ash, talc and soapstone. Cement, most important material in this group, increased from 14,599,752 barrels worth $21,249,520 in 1944 to 15,922,772 barrels worth $23,469,027.

Of the salines: This group decreased from $20,983,104 in 1944 to $18,918,432 in 1945, but the 1944 total included a considerable amount of magnesia produced before 1944 but not previously reported. Increased outputs were reported for borates, potash and soda, with all other substances showing decline.

By Substances

The following table shows the comparative yield of mineral substances of California for 1944 and 1945, as compiled from the returns received at the State Division of Mines, San Francisco, in answer to inquiry sent to producers:

Substance	1944		1945		Increase+ Decrease— Value
	Amount	Value	Amount	Value	
Bentonite	25,581 tons	$180,065	*	*	*
Borates	234,860 tons	5,264,864	257,299 tons	$5,898,823	$633,959+
Brick and hollow tile	----------	3,930,662	----------	3,523,661	407,001—
Cement	14,599,752 bbls.	21,249,520	15,922,772 bbls.	23,469,027	2,219,507+
Chromite	27,900 long tons	1,190,513	9,784 long tons	431,445	759,068—
Clay (Pottery)	491,363 tons	1,241,652	497,586 tons	1,345,966	104,314+
Copper	25,584,865 lbs.	3,453,957	13,949,675 lbs.	1,883,206	1,570,751—
Dolomite	217,018 tons	619,425	*	*	* —
Gold	117,373 fine ozs.	4,108,055	147,938 fine ozs.	5,177,830	1,069,775+
Granite	----------	222,943	----------	220,411	2,532—
Gypsum	558,488 tons	949,833	442,133 tons	954,696	4,863+
Iron ore	905,981 tons	2,360,694	240,917 tons	883,434	1,477,260—
Lead	11,408,381 lbs.	912,670	14,504,767 lbs.	1,247,410	334,740+
Limestone	734,425 tons	1,714,414	532,480 tons	1,626,844	87,570—
Magnesium and other	113,927 tons	4,537,381	*	*	*
Manganese ore	30,263 long tons	1,098,555	1,875 long tons	86,270	1,012,285—
Mineral water	24,445,814 gals.	812,645	26,502,875 gals.	798,430	14,215—
Natural gas	467,743,258 M cu.ft.	31,797,418	538,273,934 M cu. ft.	35,362,313	3,564,895+
Petroleum	311,717,804 bbls.	330,659,802	328,262,400 bbls.	342,756,767	12,096,965+
Platinum Group Metals	----------	----------	145 fine ozs.	6,719	6,719+
Pumice and volcanic ash	34,525 tons	272,064	89,209 tons	461,022	188,958+
Quicksilver	28,097 flasks	3,178,969	21,062 flasks	2,697,835	481,134—
Salt	769,873 tons	2,060,960	734,736 tons	2,030,226	30,734—
Sandstone	*	*	----------	7,498	----------+
Silica (glass sand and quartz)	274,291 tons	830,311	581,725 tons	1,309,564	479,253+
Silver	775,936 fine ozs.	553,910	986,998 fine ozs.	701,723	147,813+
Soapstone, talc, and pyrophyllite	64,041 tons	824,052	65,202 tons	922,682	98,630+
Soda (saltcake and soda ash)	299,574 tons	3,647,630	311,236 tons	3,793,571	145,941+
Stone, miscellaneous[a]	35,370,143 tons	25,138,003	29,449,484 tons	20,207,351	4,930,652—
Tungsten ore	203,965 units	4,835,810	71,511 units	1,587,951	3,247,859—
Zinc	16,456,103 lbs.	1,875,996	19,340,732 lbs.	2,224,184	348,188+
Unapportioned	[b]	10,251,752	[c]	12,044,732	1,792,980+
Total value	----------	$469,774,525	----------	$473,661,591	
Net increase	----------	----------	----------	----------	$3,887,066

* Included under 'Unapportioned.'

[a] Includes macadam, crushed rock, ballast, rubble, rip rap, sand and gravel.

[b] Includes antimony, asbestos, barite, bituminous rock, bromine, cadmium, calcium chloride, carbon dioxide, coal, diatomite, feldspar, fluorspar, gems, iodine, lithia, magnesite, marble, mica, mineral paint, molybdenum ore, potash, pyrite, sandstone. sillimanite, slate, strontium, tin, titanium, tube-mill pebbles.

[c] Includes asbestos, barite, bentonite, bituminous rock, bromine, calcium chloride, carbon dioxide, coal, diatomite, dolomite, feldspar, garnets (abrasive), gems, iodine, lithia, magesite, magnesia, mica (sericite), mineral paint, potash, pyrite, sillimanite group, slate, strontium minerals, tube mill pebbles.

By Counties

The following table shows the comparative value of the mineral production of the various counties in the State for the years 1944 and 1945:

County	1944	1945
Alameda	$8,089,026	$6,661,939
Alpine	2,214	1,500
Amador	283,206	487,544
Butte	929,239	663,610
Calaveras	2,642,638	2,789,881
Colusa	14,491	7,083
Contra Costa	3,244,179	2,496,533
Del Norte	509,703	341,306
El Dorado	298,859	301,627
Fresno	49,800,782	51,677,246
Glenn	33,736	72,046
Humboldt	373,525	201,514
Imperial	564,263	383,431
Inyo	6,716,413	4,258,250
Kern	108,257,342	126,716,070
Kings	13,984,044	13,568,174
Lake	468,389	197,448
Lassen	26,495	20,635
Los Angeles	108,138,154	103,641,827
Madera	74,141	189,886
Marin	312,849	491,435
Mariposa	1,306,411	1,171,094
Mendocino	152,039	118,767
Merced	853,905	285,363
Modoc	255,229	193,156
Mono	123,173	91,928
Monterey	4,942,121	3,018,280
Napa	709,686	628,974
Nevada	619,179	1,196,433
Orange	33,312,154	35,178,471
Placer	250,237	241,359
Plumas	78,714	41,243
Riverside	5,203,973	4,644,406
Sacramento	7,832,687	9,240,880
San Benito	1,985,039	1,949,386
San Bernardino	23,358,596	23,038,011
San Diego	1,985,032	1,142,350
San Francisco	120,000	75,172
San Joaquin	1,369,198	1,256,594
San Luis Obispo	704,818	497,923
San Mateo	2,452,525	2,363,508
Santa Barbara	23,908,079	22,643,580
Santa Clara	5,228,668	5,810,388
Santa Cruz	1,762,807	2,015,407
Shasta	2,615,373	2,119,802
Sierra	114,195	172,782
Siskiyou	2,507,921	926,305
Solano	5,973,575	5,282,725
Sonoma	905,121	807,122
Stanislaus	545,376	406,727
Sutter	89,246	62,910
Tehama	101,823	69,921
Trinity	516,066	91,560
Tulare	615,630	256,764
Tuolumne	465,734	434,626
Ventura	30,545,897	29,352,740
Yolo	394,299	479,810
Yuba	1,106,311	1,186,139
Total value	$469,774,525	$473,661,591

Total Mineral Production of California, by Years, Since 1887

The following tabulation gives the total value of mineral production of California by years since 1887, in which year compilation of such data by the State Mining Bureau (now Division of Mines) began. At the side of these figures have been placed the values of the most important metal and nonmetal items—gold and petroleum.

In the same period copper made an important growth beginning with 1897 following the entry of the Shasta County mines, and later Plumas County. Cement increased rapidly from 1902, while crushed rock, sand and gravel as a group paralleled the cement increase. Quicksilver has been up and down. Mineral water and salt have always been important items, but the values fluctuate. Borax has increased materially since 1896. War-time increases, 1915-1918 and 1940-1944, were shown by chromite, copper, lead, magnesite, manganese, silver, tungsten and zinc. Most of these later declined, though silver, structural materials and copper increased in 1920-1924. Natural gas showed a steady increase from 1907, and in 1928-1934, also in 1943-1945, its value was second only to petroleum. In 1939-1944 increases in output similar to those of 1915-1918 were shown by many mineral substances.

In 1929 the output of gold was the smallest of any year since its discovery, up to that time. From 1930 to 1940 there was a rapid increase in gold production, owing in part to the rise in price per ounce, then from 1941 to 1944 the sharpest decline in the gold yield with the smallest annual production in 1944.

Total Mineral Production of California, by Years, Since 1887

Year	Total value of all minerals	Gold, value	Petroleum, value
1887	$19,785,868	$13,588,614	$1,357,144
1888	19,469,320	12,750,000	1,380,666
1889	16,681,731	11,212,913	368,048
1890	18,039,666	12,309,793	384,300
1891	18,872,413	12,728,869	401,264
1892	18,300,168	12,571,900	561,333
1893	18,811,261	12,422,811	608,092
1894	20,203,294	13,923,281	1,064,521
1895	22,844,663	15,334,317	1,000,235
1896	24,291,398	17,181,562	1,180,793
1897	25,142,441	15,871,401	1,918,269
1898	27,289,079	15,906,478	2,376,420
1899	29,313,460	15,336,031	2,660,793
1900	32,622,945	15,863,355	4,152,928
1901	34,355,981	16,989,044	2,961,102
1902	35,069,105	16,910,320	4,692,189
1903	37,759,040	16,471,264	7,313,271
1904	43,778,348	19,109,600	8,317,809
1905	43,069,227	19,197,043	9,007,820
1906	46,776,085	18,732,452	9,238,020
1907	55,697,949	16,727,928	16,783,943
1908	66,363,198	18,761,559	26,566,181
1909	82,972,209	20,237,870	32,398,187
1910	88,419,079	19,715,440	37,689,542
1911	87,497,879	19,738,908	40,552,088
1912	88,972,385	19,713,478	41,868,344
1913	98,644,639	20,406,958	48,578,014
1914	93,314,773	20,653,496	47,487,109
1915	96,663,369	22,442,296	43,503,837
1916	127,901,610	21,410,741	57,421,334
1917	161,202,962	20,087,504	86,976,209
1918	199,753,837	16,529,162	127,459,221
1919	195,830,002	16,695,955	142,610,563
1920	242,099,667	14,311,043	178,394,937
1921	268,157,472	15,704,822	203,138,225
1922	245,183,826	14,670,346	173,381,265
1923	344,024,678	13,379,013	242,731,309
1924	374,620,789	13,150,175	274,652,874
1925	434,519,660	13,065,330	330,609,829
1926	450,330,856	11,923,481	345,546,677
1927	366,781,394	11,671,018	260,735,498
1928	332,224,233	10,785,315	229,998,680
1929	432,248,228	8,526,703	321,366,863
1930	365,604,695	9,451,162	271,699,046
1931	215,964,420	10,814,162	141,835,723
1932	199,196,493	11,765,726	143,890,247
1933	206,489,058	15,683,075	143,063,972
1934	237,374,709	25,131,284	159,529,671
1935	263,404,317	31,165,050	179,335,311
1936	327,804,268	37,710,470	211,667,185
1937	361,515,951	41,110,230	237,845,872
1938	380,444,976	45,889,515	258,345,343
1939	352,462,564	50,234,240	226,358,856
1940	342,825,817	50,948,485	207,479,800
1941	374,326,228	49,307,755	218,838,171
1942	408,738,434	29,679,895	242,481,545
1943	426,445,280	5,191,480	289,323,406
1944	469,774,525	4,108,055	330,659,802
1945	473,661,591	5,177,830	342,756,767
Totals	$10,891,933,513	$1,108,088,003	$6,976,506,363

CHAPTER TWO

FUELS

Among the most important mineral products of California are its fuels. This subdivision includes coal, natural gas, and petroleum, the combined values of which make up practically 80 percent of the State's entire mineral output for the year 1945.

There are deposits of peat known in several localities in California, small amounts of which are used as a fertilizer, and in stockfood preparations, but none has yet been recorded as utilized for fuel.

Comparison of values during 1944 and 1945 is shown in the following table:

Substance	1944		1945		Increase + Decrease — Value
	Amount	Value	Amount	Value	
Coal*					
Natural gas	467,743,258 M cu. ft.	$31,797,418	538,273,934 M cu. ft.	$35,362,313	$3,564,895+
Petroleum	311,717,804 bbls.	330,659,802	328,262,400 bbls.	342,756,767	12,096,965+
Total values		$362,457,220		$378,119,080	
Net increase					$15,661,860

* Concealed under "Unapportioned."

COAL

Bibliography: State Mineralogist Reports VII, XII-XV (inc.), XVII, XIX-XXVIII (inc.), XXVI, XXXI, XXXV, XXXVII, XXXIX, U. S. Geol. Surv., Bulletins 285, 316, 421, 431, 471, 581; Ann. Rept. 22, Pc. III.

The coal produced in California during 1945 is concealed under the "Unapportioned" item so as not to reveal the output of a single producer in Trinity County. The 1943-1944 total production amounted to 219 net tons valued at $1,721 f. o. b. mine. This coal was consumed by the local market and also used on the property for camp purposes, power and forge, to carry on regular operations and development work.

Total Coal Production of California

The very considerable output of coal in the years previous to 1883 was almost entirely from the Mount Diablo district, Contra Costa County. Later the Tesla mine in Corral Hollow, Alameda County, was an important producer for a few years. Stone Canyon, Monterey County, was also an important producer for a short time, and some coal has been shipped from properties in Amador, Fresno, Orange, Riverside, Siski-

you and Trinity counties. The following tabulation gives the annual tonnages and values, according to available records:

Coal Output and Value, by Years

Year	Tons	Value	Year	Tons	Value
1861	6,620	$38,065	1904	79,062	$376,494
1862	23,400	134,550	1905	46,500	144,500
1863	43,200	248,400	1906	24,850	61,600
1864	50,700	291,525	1907	23,734	55,849
1865	60,530	348,048	1908	18,496	55,503
1866	84,020	483,115	1909	49,389	216,913
1867	124,690	716,968	1910	11,033	23,484
1868	143,676	826,137	1911	11,047	18,297
1869	157,234	904,096	1912	14,484	39,092
1870	141,890	815,868	1913	25,198	85,809
1871	152,493	876,835	1914	11,859	28,806
1872	190,859	1,097,439	1915	10,299	26,662
1873	186,611	1,073,013	1916	4,037	7,030
1874	215,352	1,238,274	1917	3,527	7,691
1875	166,638	958,169	1918	6,343	16,149
1876	128,049	736,282	1919	2,983	8,203
1877	107,789	619,787	1920	2,078	5,450
1878	134,237	771,863	1921	12,467	63,578
1879	147,879	850,304	1922	27,020	135,100
1880	236,950	1,362,463	1923	1,010	5,090
1881	140,000	805,000	1924	1,425	8,800
1882	112,592	647,404	1925	730	3,880
1883	76,162	380,810	1926	1,100	5,000
1884	77,485	309,950	1927	200	1,100
1885	71,615	286,460	1928	782	4,542
1886	100,000	300,000	1929	450	2,476
1887	50,000	150,000	1930	10,885	59,858
1888	95,000	380,000	1931	12,551	77,607
1889	121,280	288,232	1932	9,508	36,468
1890	110,711	283,019	1933	2,612	11,367
1891	93,301	204,902	1934	13,549	52,720
1892	85,178	209,711	1935	8,049	32,745
1893	72,603	167,555	1936	370	1,815
1894	59,887	139,862	1937	269	2,933
1895	79,858	193,790	1938	275	1,650
1896	70,649	161,335	1939	1,750	8,100
1897	87,449	196,255	1940		
1898	143,045	337,475	1941	190	1,046
1899	160,941	420,109	1942		
1900	176,956	535,531	1943	219	1,721
1901	150,724	401,772	1944		
1902	88,460	248,622	1945	*	*
1903	93,026	265,383			
			Totals	5,270,069	$23,399,506

The tonnages in the above table for the years 1861-1866 (incl.) are taken from the U. S. Geological Survey, "Mineral Resources of the U. S., 1910," p. 107. The values assigned for the years previous to 1883 are those given by W. A. Goodyear (Mineral Res., 1882, pp. 93-94), being an average of $5.75 per ton. From 1887 to date the figures are those of the California State Mining Bureau.

* Annual details concealed under 'Unapportioned.'

NATURAL GAS

Bibliography: State Mineralogist Reports VII, X, XII, XIII, XIV, XXIX, XXXVII. Bulletins 3, 16, 19, 69, 73, 89, 118. Summary Oil and Gas Supervisor, Dec., 1919; Aug., 1922; Mar., 1923; Mar. and Apr., 1926.

Statistics on the production of natural gas in California are in a considerable degree difficult to arrive at, as much of it that is utilized directly at the wells for heating, lighting, and driving gas engines is not measured. Hence, it is necessary to approximate the output of many of the operators in the oil fields, estimated on the number of lights, and on the number and horsepower of gas engines and steam boilers thus operated. The figures here given are for gas utilized locally and also that sold for distribution to consumers; and we consider are not over-

estimated, particularly in the seven oil-producing counties. It must be remembered that some of our important oil fields are removed many miles from the site of any other industry, and that the gathering of small amounts of gas and transporting it for any considerable distance may not always be profitable, nor is it often possible to have pipe-line facilities available to handle the gas accompanying the early gas production in newly developed fields. Wherever feasible, casing-head gas is used in driving gas engines for pumping and drilling, and in firing the boilers of steam-driven plants.

Production and Value

During 1945 there were 538,273,934 M. cu. ft. of natural gas, worth $35,362,313, produced and utilized (sold or used) in California as reported to the Division of Mines, compared with 467,743,258 M. cubic feet, valued at $31,797,418 in 1944. The 1945 output of utilized natural gas is the largest annual yield on record in this State. Distribution by counties of natural gas utilized in 1945 was as follows:

County	M cubic feet	Value
Fresno	46,897,552	$2,832,579
Kern	76,648,176	3,972,990
Kings	53,291,804	3,010,740
Los Angeles	92,482,309	6,514,113
Orange	26,433,452	1,735,206
Sacramento	88,406,045	6,736,811
San Joaquin	9,337,104	670,838
Santa Barbara	16,031,402	863,157
Solano	62,376,521	5,245,415
Ventura	55,451,887	3,049,832
Contra Costa, Humboldt, Glenn, Madera, Mendocino, Stanislaus, Sutter, Tulare, and Yolo*	10,917,682	730,632
Totals	538,273,934	$35,362,313

* Combined to conceal output of individuals.

Increases in the amount of utilized natural gas over 1944 were reported in Fresno, Glenn, Humboldt, Kern, Los Angeles, Madera, Orange, Sacramento, Santa Barbara, Ventura and Yolo counties, while decreased outputs were registered by Contra Costa, Kings, San Joaquin, Solano, Stanislaus, and Tulare counties. Los Angeles County, which led in quantity output from 1922 to 1942, though exceeded in value only in 1944 by both Sacramento and Solano counties, was passed in value in 1945 by Sacramento County only.

A rather wide variation in prices is quoted for natural gas because a considerable part is used directly in the field for driving gas engines and firing boilers, and is therefore not measured nor sold. Such companies as have placed a valuation on gas that was thus used in 1945 gave from 1.5¢ to 32¢ per 1000 cu. ft. at the well. From the totals shown in the tabulation following herein, the average value for all fields in 1945 works out at approximately 6.57¢ per M cu. ft. Approximately 7000 cu. ft. of gas is equal to one barrel of oil in heating value, and is so accounted for by many operators. In driving gas engines, about 4000 cu. ft. per 24 hr. are consumed by a 25-h.p. engine, and 63,700 cu. ft. per day for heating a 70-h.p. steam boiler, which figures have been utilized in compiling this report, in those cases where gas was not metered.

Natural Gas Production in California Since 1888

The production of natural gas in California by years since 1888 is given in the following table. The first economic use of natural gas in California was from the famous courthouse well at Stockton, bored in 1854-1858. Beginning about 1883 and for several succeeding years, a number of gas wells were brought in around Stockton, and later at Sacramento. Natural gas was known in a number of other localities, and occasionally utilized in a small way, notably at Kelseyville in Lake County, and in Humboldt County near Petrolia and Eureka, but there are no available authentic records of amounts or values previous to the year 1888. The most important developments in the commercial production of natural gas have been coincident with developments in the oil fields, by utilizing the casing-head gas as well as that from dry-gas wells, the most recent from the latter being in Solano and Sacramento counties.

Natural Gas Production in California Since 1888

Year	M cubic feet	Value	Year	M cubic feet	Value
1888	[a]12,000	$10,000	1917	44,343,020	$2,964,922
1889	[a]14,500	12,680	1918	46,373,052	3,289,524
1890	[a]41,250	33,000	1919	52,173,503	4,041,217
1891	[a]39,000	30,000	1920	58,567,772	3,898,286
1892	[a]75,000	55,000	1921	67,043,797	4,704,678
1893	[a]84,000	68,500	1922	103,628,027	6,990,030
1894	[a][b]85,000	75,000	1923	240,405,397	15,661,433
1895	[a][b]110,000	100,000	1924	209,021,596	15,153,140
1896	[a][b]131,000	110,157	1925	194,719,924	15,890,082
1897	[a]71,300	62,657	1926	214,549,477	19,465,347
1898	[a]111,165	74,424	1927	224,686,940	20,447,294
1899	115,110	95,000	1928	260,887,116	22,260,947
1900	40,566	34,578	1929	400,129,201	29,675,546
1901	120,800	92,034	1930	315,513,952	24,559,840
1902	120,968	99,443	1931	344,959,920	16,690,695
1903	120,134	75,237	1932	284,168,872	16,272,061
1904	144,437	91,035	1933	271,743,544	15,403,514
1905	148,345	102,479	1934	263,207,517	14,408,761
1906	168,175	109,489	1935	302,447,193	17,680,661
1907	169,991	114,759	1936	298,922,708	18,585,970
1908	842,883	474,584	1937	323,883,714	19,859,865
1909	1,148,467	616,932	1938	332,358,439	22,310,755
1910	10,579,933	1,676,367	1939	340,754,804	21,551,646
1911	[a]5,000,000	491,859	1940	352,871,945	20,618,983
1912	[a]12,600,000	940,076	1941	378,173,737	21,522,445
1913	14,210,836	1,053,292	1942	413,180,942	25,698,052
1914	16,529,963	1,049,470	1943	443,219,847	28,046,729
1915	21,992,892	1,706,480	1944	467,743,258	31,797,418
1916	28,134,365	2,871,751	1945	538,273,934	35,362,313
			Totals	7,900,915,228	$527,138,437

[a] Quantity, in part, estimated, where values only were reported.
[b] Tabulations published previously to 1933 included values of CO_2, now shown under "Industrial Materials."

Gasoline from Natural Gas

More or less gas usually accompanies the petroleum in the oil fields, and such gas carries varying amounts of gasoline. A total of 80 plants were in operation in 1945 recovering gasoline by compression or absorption from this "casing-head" gas. After the gasoline is extracted the remaining "dry gas" so far as practicable is taken into pipe lines, by which it is distributed to consumers, both domestic and commercial.

Natural gas gasoline produced during 1945 was reported from all fields by 80 plants; a total of 642,336,668 gallons valued at $26,031,276, as compared with 610,904,480 gallons worth $27,565,477 from 80 plants in 1944. In 1945 there was also a total of 141,846,564 gallons of liquefied

petroleum gases valued at $3,505,085, compared with 118,100,084 gallons worth $2,857,168 as reported for 1944.

Natural Gas Gasoline and Liquefied Natural Gas for 1945

County	Natural gas gasoline		Liquefied natural gases	
	Gallons	Value	Gallons	Value
Fresno and Kings	108,356,676	$4,397,974	58,747,671	$1,411,367
Kern	101,547,060	3,696,096	51,196,811	1,392,592
Los Angeles	231,326,447	10,230,467	8,936,600	240,833
Orange	90,289,809	3,317,704	5,558,545	105,078
Santa Barbara	19,662,836	801,814	3,302,256	73,122
Ventura	91,153,840	3,587,221	14,104,681	282,093
Totals	642,336,668	$26,031,276	141,846,564	$3,505,085

The usual recoveries of gasoline from natural gas very from ½ gal. to 3 gal. per 1000 cu. ft. of gas handled, the average being about 1 gal. per 1000 cu. ft. The U. S. Bureau of Mines Report by Knudsen [1] gives the average recovered for 1945 as 1.598 gallons per 1000 cubic feet of gas treated. His figures show the following production by methods:

	M cubic feet natural gas treated	Gallons of gasoline recovered	Recovery gallons per M cubic feet
Oil absorption	414,932,406	652,275,837	1.272

PETROLEUM

Bibliography: State Mineralogist Reports IV, VII, X, XII, XIII, XXIX, XXXI, XXXIII-XXXV, XXXVII, XXXIV. Bulletins 3, 11, 16, 19, 31, 32, 63, 69, 73, 82, 84, 89, 118. Reports of Oil and Gas Supervisor 1915 to date (issued in monthly chapters since April 1919, to June, 1929, and quarterly from then on.) U. S. Geol. Surv. Bulletins 213, 285, 309, 317, 321, 322, 340, 357, 398, 406, 431, 471, 541, 581, 603, 621, 623, 653, 691. Prof. Papers 116, 117. "American Petroleum; Supply and Demand"; Amer. Petr. Inst., 1925.

Crude petroleum produced in California during 1945 amounted to a total of 328,262,400 barrels, valued at $342,756,767 at the well. This is the largest annual yield of crude oil ever reported in this State although the 1926 value exceeded that of 1945. The 1944 output was 311,717,804 barrels, worth $330,659,802. The totals of quantity are compiled from monthly reports filed by the operators with the State Oil and Gas Supervisor. Prices paid for crude oil were the same in 1945 as in 1944, but on the first of August, 1944, subsidies were granted to producers in those oilfields where the output per well per day was less than nine barrels. This subsidy is still in effect.

The question of the value of the crude oil yield at the well is a difficult one to settle with exactitude principally because a large part of the output is not sold until after refining. The large refiners are also

[1] Knudsen, E. T., The Petroleum Situation in the Pacific Coast Territory (Monthly for 1945), U. S. Bureau of Mines.

large producers of crude oil which they send direct from well to plant, hence much of the crude oil is not sold as such.

The value used in the statistical reports of the State Mining Bureau and the Division of Mines from 1914 to 1927 (inc.) was derived from an average of actual sales of crude oil of all grades in each field of the State and their average applied to the total yield of each respective field. The 1929-1933 values, used by the Division of Mines, were obtained by using the production of crude oil by gravities produced in each field and applying an average of current price quotations for crude oil at the well as compiled by California Oil and Gas Association.

The values given to the 1944-1945 petroleum output by this department were obtained by using the average gravity oil for each field, to which was applied the average quotation for the year of said grade oil.

TABLE A

Production and Value of Crude Oil by Counties

County	1944		1945	
	Barrels	Value	Barrels	Value
Fresno	45,325,244	$46,159,669	44,370,645	$47,822,774
Kern	92,694,311	98,829,308	110,290,276	116,846,281
Kings	9,459,556	10,689,298	8,375,249	10,556,594
Los Angeles	88,646,069	95,872,140	85,192,691	89,404,673
Orange	30,417,719	31,227,748	32,214,458	32,988,702
Santa Barbara	21,298,935	21,012,512	23,140,412	19,397,091
Ventura	23,797,902	26,792,447	24,638,277	25,705,785
Other counties	[a]78,068	76,680	[a]40,392	34,867
Totals	311,717,804	$330,659,802	328,262,400	$342,756,767

[a] Includes San Luis Obispo and Santa Clara Counties.

It will be noted in the above table such major petroleum producing counties as Kern, Orange, Santa Barbara, and Ventura showed an increase in output in 1945 over that of 1944, with other counties showing a decline, although the value of Fresno County was higher. Kern County led all others, passing Los Angeles County, which outranked Kern from 1923 to 1943, inclusive.

The foregoing totals showed an average price of $1.044 per barrel for the year 1945, as compared with $1.061 in 1944; $1.018 in 1943, $0.980 in 1942, $0.953 in 1941, $0.929 in 1940, $1.009 in 1939, $1.038 in 1938, $0.997 in 1937, $0.986 in 1936, and $0.870 in 1935.

TABLE B

Average Price of Oil per Barrel, by Counties, 1936-1945

County	1936	1937	1938	1939	1940	1941	1942	1943	1944	1945
Fresno	$1.209	$1.255	$1.261	$1.173	$1.068	$0.963	$0.885	$0.998	$1.084	$1.078
Kern	.863	.886	.890	.826	.838	.878	0.894	1.015	1.066	1.059
Kings	1.338	1.390	1.390	1.430	1.262	1.217	1.250	1.250	1.130	1.260
Los Angeles	.974	.968	1.064	1.064	.941	1.008	1.039	1.025	1.081	1.049
Orange	.937	.945	.956	.952	.900	.901	1.055	0.996	1.027	1.024
San Luis Obispo										
Santa Barbara	1.143	1.083	.974	.830	.620	.644	0.709	0.830	0.987	0.838
Santa Clara										
Ventura	.971	1.050	1.102	1.090	1.087	1.102	1.129	1.105	1.121	1.043
State averages	$0.986	$0.997	$1.038	$1.009	$0.929	$0.953	$0.980	$1.018	$1.061	$1.044

For several years previous to 1919, the State average value per barrel at the well for crude oil as determined by the statistical returns was noted to practically coincide with the quotations during the same years for 23° gravity oil in the San Joaquin Valley fields. In 1919 and since, the average values have worked out at figures corresponding to quotations up to, in one year as high as 28° oil, due to the large yield of high-gravity oils from the new fields in the Los Angeles-Orange counties area.

The presence of oil seepages and springs in Los Angeles and Ventura counties was known and utilized in a small way early in the history of California. Some also was shipped to refineries at San Francisco from Santa Barbara and Humboldt counties. In the light of present-day developments, the following reference to the previous year's production of oil and its future prospects as expressed by the San Francisco Bulletin of January 8, 1866, is strikingly prophetic even though skeptical:

"It is possible that the small quantity received (40,000 or 50,000 gallons in 1865) may be the forerunner of many millions which will, at some future time, lubricate the wheels of commerce and set a trade at work excelling in variety any that has thus far been known on this coast. At present, however, we admit to being a little skeptical about the assumption of the astute Professor Silliman that California will be found to have more oil in its soil than all the whales in the Pacific Ocean."

According to Hanks,[1] in 1874 production amounted to 36 bbl. per day from natural flows in Pico Cañon (Newhall), and at Sulphur Mountain (Ventura County), the oil being of 32° gravity average.

"Work was commenced in Pico Canyon in 1875 by drilling three shallow wells with spring pole, all of which yielded oil at depths of from 90 to 250 feet. Actual work of development commenced with steam machinery in 1877." [2]

In 1877 Pico averaged 40-50 bbl. daily, and Ventura 80 bbl. daily. In 1878, there was some production (at 60 bbl. per day, for a time) from wells in Moody Gulch, near Los Gatos, Santa Clara County, the oil being of 46° Baumé.

The first wells in the Coalinga, Fresno County, and Summerland, Santa Barbara County, fields were drilled in 1890, but Coalinga did not make its influence felt conspicuously on the state's annual output until 1903. The Summerland yield never has been large. The Salt Lake field near Los Angeles began production in 1894 and in 1897 reached over a million barrels annually.

In the Kern County fields, the first well was drilled in Sunset in 1891, Midway in 1900, McKittrick in 1892, Kern River in 1899. The Sunset-Midway district attained a yield of over 4,000,000 bbl. in 1909, and over 20,000,000 bbl. in 1910. Kern River field produced over 3,000,000 bbl. in 1901.

The first well in the Santa Maria-Lompoc group, Santa Barbara County, was drilled in 1901, and the district advanced to a yield of over 3,000,000 bbl. annually in 1905.

The Whittier-Fullerton field in Los Angeles and Orange counties became an important factor in 1902. The Montebello field, Los Angeles County, was the conspicuous addition in 1918-1919; and Elk Hills, Kern County, with Huntington Beach and Richfield, Orange County,

[1] Hanks, Henry G., Report IV of State Mineralogist, p. 298, 1884.
[2] Idem, p. 301.

in 1920. In 1921, the new fields added were Long Beach and Santa Fe Springs, Los Angeles County; in 1922, Torrance field in Los Angeles County, and Wheeler Ridge field in Kern County; but the production from the large number of new wells started in these new Los Angeles County fields did not reach its peak until August and September, 1923. Dominguez (Compton) came in during 1923; followed by Rosecrans and Inglewood in 1924. Ventura recorded important additions to its producing area in 1925 and 1926. Seal Beach, Orange County, and Mt. Poso, Kern County, were the new fields added in 1926; Round Mountain, Kern County, and Rincon, Ventura County, were the new fields added in 1927; with Potrero in Los Angeles County, Elwood in Santa Barbara County and Kettleman Hills in Kings County in 1928.

During 1929 Playa del Rey was added to the oil fields in Los Angeles County, and more recently a number of others have been added in Fresno, Los Angeles, Kern, and Santa Barbara.

The effect of the advent of these various fields to the producing column will be noted in the tabulation herewith, by years:

TABLE C

Total Petroleum Production in California

Year	Barrels	Value	Year	Barrels	Value
To and including 1875	[a]175,000	[b]$472,500	1911	84,648,157	$40,552,088
1876	12,000	30,000	1912	89,689,250	41,868,344
1877	13,000	29,250	1913	98,494,532	48,578,014
1878	15,227	30,454	1914	102,881,907	47,487,109
1879	19,858	39,716	1915	91,146,620	43,503,837
1880	40,552	60,828	1916	90,262,557	57,421,334
1881	99,862	124,828	1917	95,296,309	86,976,209
1882	128,636	257,272	1918	99,731,177	127,459,221
1883	142,857	285,714	1919	101,182,962	142,610,563
1884	262,000	655,000	1920	103,377,361	178,394,937
1885	325,000	750,750	1921	112,599,860	203,138,225
1886	[a]377,145	[b]870,205	1922	138,468,222	173,381,265
1887	678,572	1,357,144	1923	262,875,690	242,731,309
1888	690,333	1,380,666	1924	228,933,471	274,652,874
1889	303,220	368,048	1925	232,492,147	330,609,829
1890	307,360	384,200	1926	224,673,281	345,546,677
1891	323,600	401,264	1927	231,195,774	260,735,498
1892	385,049	561,333	1928	231,811,465	229,998,680
1893	470,179	608,092	1929	292,534,221	321,366,863
1894	783,078	1,064,521	1930	227,328,988	271,699,046
1895	1,245,339	1,000,235	1931	188,310,605	141,835,723
1896	1,257,780	1,180,793	1932	177,745,286	142,890,247
1897	1,911,569	1,918,269	1933	172,139,362	143,063,972
1898	2,249,088	2,376,420	1934	174,721,282	159,529,671
1899	2,677,875	2,660,793	1935	205,979,855	179,335,311
1900	4,319,950	4,152,928	1936	214,776,227	211,667,185
1901	7,710,315	2,961,102	1937	238,558,562	237,845,872
1902	14,356,910	4,692,189	1938	249,395,763	258,354,343
1903	24,340,839	7,313,271	1939	224,253,110	226,358,856
1904	29,736,003	8,317,809	1940	223,294,805	207,479,800
1905	34,275,701	9,007,820	1941	229,664,784	218,838,171
1906	32,624,000	9,238,020	1942	247,491,289	242,481,545
1907	40,311,171	16,783,943	1943	284,145,702	289,323,406
1908	48,306,910	26,566,181	1944	311,717,804	330,659,802
1909	58,191,723	32,398,187	1945	328,262,400	342,756,767
1910	77,697,568	37,689,542	Totals	6,996,846,056	$6,979,121,880

[a] U. S. G. S. Min. Res. of U. S., 1886, p. 440, for quantities to and including 1886.

[b] Values have been estimated for the years to and including 1886, after consulting a number of contemporaneous publications, including the Mining & Scientific Press, Reports of the State Mineralogist, and U. S. Reports. The figures for 1887 to date are from records of the State Mining Bureau.

Well Data:

The following table is compiled from monthly statements issued by the American Petroleum Institute:

TABLE D

Wells Operated, by Fields—1945

Field	Wells producing Dec., 1944	Wells producing Dec., 1945	Wells completed during year	Daily initial output	Wells abandoned during year	Bbls. per well produced per day Dec., 1944	Bbls. per well produced per day Dec., 1945
GROUP No. 1							
Ant Hill		20	16	1,425	4		53.0
Antelope Hills	28	29	4	573		64.1	58.7
Antelope Plains							
Arvin	2	2				14.5	17.5
Bellevue	3	3			3	221.0	145.3
Belridge, North	77	84	7	3,199	5	89.3	66.2
Belridge, South	693	796	111	3,785	25	17.3	13.5
Blackwell's Corner		21	6	135	1		9.5
Brundage							
Buena Vista Hills	889	1,027	140	52,481	33	33.3	38.9
Burrel	2	2				33.0	7.5
Canal	39	39				90.6	71.6
Canfield-Gosford	2	2	1	192	1	19.0	62.5
Canfield Ranch	1	1			1	26.0	33.0
Coalinga, East	684	590	57	6,331	20	33.0	31.4
Coalinga, Nose	218	218	2	460	4	282.7	242.4
Coalinga, West	762	775	18	1,231	9	10.4	9.1
Coles Levee, North	101	83	8	3,308		168.7	268.2
Coles Levee, South		34	8	2,066	2		67.9
Dyer Creek							
Edison	136	186	51	25,021	8	24.9	58.4
Elk Hills	340	255	213	61,092	1	123.9	56.2
Fruitvale	198	209	9	543	2	41.0	38.8
Greeley	90	97	10	3,814	5	160.1	107.3
Helm	24	46	19	3,354		112.2	92.8
Jacalitos	16	42	26	5,643	3	71.8	97.9
Kern Front	715	758	44	2,849	17	18.0	16.0
Kern River	2,028	2,044	27	879	7	4.9	4.6
Kettleman North Dome	295	306	19	8,150		138.7	124.3
Lanare	3	15	12	2,082	1	70.3	86.3
Lost Hills	373	386	12	416	1	9.1	9.0
McClung	2	1			1	56.5	36.0
McKittrick	323	356	33	7,445	6	17.6	21.8
Midway-Sunset	2,681	2,731	51	2,943	67	15.2	13.7
Mountain View	169	164	2	450	12	18.5	16.6
Mount Poso	481	503	26	1,142	12	43.3	34.9
Paloma	17	25	17	9,711	1	376.5	193.8
Pleasant Valley	17	22	5	2,363		165.2	165.4
Pyramid Hills		21	8	176	5		16.1
Race Track		10	10	3,453			101.1
Raisin City, East	8	37	7	6,258		63.6	73.0
Raisin City, West	19					146.4	
Rio Bravo	100	100				161.8	134.0
Riverdale	45	52	7	1,012	2	120.0	64.2
Rosedale Ranch		4	4	256			44.3
Round Mountain	295	322	29	2,838	7	33.4	29.2
Santiago		5	5	3,790	1		253.4
Shafter	1					10.0	
Sheep Springs		5	3	826	3		116.4
Strand, East	6	7	1	1,410	1	116.5	85.1
Strand, West	17	17				104.1	99.7
Tejon	7	19	13	1,032		37.0	24.7
Ten Section	119	118			4	101.0	73.5
Union Avenue	3	5	1	200		29.3	34.0
Wasco	13	12			1	154.0	81.8
Wheeler Ridge	34	34				7.2	6.3
Miscellaneous fields	37	8	2	45	4	17.8	6.0

TABLE D—Continued

Wells Operated, by Fields—1945

Field	Wells producing Dec., 1944	Wells producing Dec., 1945	Wells completed during year	Daily initial output	Wells abandoned during year	Bbls. per well produced per day Dec., 1944	Bbls. per well produced per day Dec., 1945
GROUP No. 2							
Aliso Canyon	26	34	7	4,692		135.7	88.7
Bradley Canyon					1		
Capitan	53	58	9	4,944		46.6	53.9
Del Valle	17	20	4	2,828	2	106.0	117.9
Elwood	57	63	6	1,196		99.8	93.8
Gato Ridge	30	36	6	1,621	2	154.8	64.5
Hasley Canyon							
Newhall-Potrero	46	51	5	1,561	1	97.3	115.1
Oak Canyon	9	15	5	731	1	139.4	125.2
Oxnard		6	2	146			150.8
Padre Canyon	21	25	4	2,439		87.6	99.3
Ramona		5	5	1,060	1		93.2
Rincon	87	98	14	2,045	2	55.2	50.2
San Martinez	23	30	7	4,438	1	114.5	111.9
San Miguelito	31	36	5	2,229		191.6	134.0
Santa Barbara	14	14				5.5	6.6
Santa Maria	310	319	12	2,524	8	46.0	40.6
Santa Maria Valley	343	413	77	13,956	7	107.3	81.9
Summerland	5					1.0	
Ventura Avenue	487	539	50	30,525	1	109.1	86.1
Ventura-Newhall	528	560	40	3,833	13	12.2	11.5
Watsonville	7	7				3.6	3.6
Zaca Creek		1					256.0
GROUP No. 3							
Brea-Olinda	409	361	2	253	7	29.1	29.6
Buena Park	2	2			2	58.0	54.0
Coyote, East	144	151	7	659	1	37.4	32.4
Coyote, West	136	159	23	6,441	2	90.9	98.5
Dominguez	308	316	11	2,643	1	64.5	54.5
El Segundo	33	29			7	25.1	23.3
Huntington Beach	794	839	46	7,388	35	59.6	55.3
Inglewood	303	304	1	83		54.9	46.1
Lawndale	3	3				9.3	5.3
Long Beach	1,143	1,137	3	97	55	24.8	23.0
Los Angeles-Salt Lake	97	94			1	5.8	5.0
Montebello	348	353	8	683	7	30.3	26.6
Newport-Costa Mesa	1	49	49	4,887	13	11.8	49.1
Playa del Rey	111	109			2	22.8	20.3
Potrero	26	28	1	315		36.8	42.1
Richfield	320	334	13	1,696	9	21.7	22.4
Rosecrans	197	204	7	1,010	3	29.8	26.3
Sansinena		2	1	102			51.0
Santa Fe Springs	559	556	1	53	12	32.9	30.1
Seal Beach	141	157	17	11,203	5	57.0	59.5
Torrance	680	729	47	2,226	5	12.6	12.3
Turnbull Canyon	5	4			3	41.4	38.5
Whittier	163	167	3	89	5	6.4	5.9
Wilmington	1,314	1,468	148	24,093		74.1	65.7
Yorba Linda	13	11				56.2	11.0
EXPLORATORY							
Outposts					103		
Wildcats					120		
Totals	21,457	22,544	1,690	379,064	728	41.3	37.3

Specific Gravity of Oils Produced

The proportion of heavy and light oil produced in the various fields is shown in Table E, following, for which we are indebted to the Standard Oil Company. Specific gravities in California range from 8° Baumé in the Casmalia field, Santa Barbara County, to 65° in Helm field, Fresno County.

California crude oils are all essentially of asphalt base, with a few notable exceptions. In the following localities are wells yielding crudes containing both asphalt and paraffine constituents: Oil City field, Coalinga; a few deep wells in East Side field, Coalinga; a considerable part of the Ventura County field; Western Minerals area, south of Maricopa; Wheeler Ridge, Kern County.

TABLE E

Production of Light and Heavy Oils, by Fields, for 1945

Field	Under 20° (barrels)	20° and above (barrels)	Total (barrels)
SAN JOAQUIN VALLEY			
Ant Hills	74,598	140,443	215,041
Antelope Hills	678,116		678,116
Antelope Plains	7,745		7,745
Arvin		13,832	13,832
Bellevue		191,998	191,998
Belridge, North	132,412	2,197,992	2,330,404
Belridge, South	4,573,359	55,017	4,628,376
Blackwell's Corner	54,677		54,677
Brundage	9,933		9,933
Buena Vista Hills	576	15,577,110	15,577,686
Burrel		12,360	12,360
Canal		1,250,192	1,250,192
Canfield Ranch		11,913	11,913
Coalinga—East and West	3,848,214	6,597,522	10,445,736
Coalinga—Eocene		21,200,483	21,200,483
Coffee Canyon	567,071		567,071
Coles Levee—North and South		7,027,234	7,027,234
Devil's Den	4,759		4,759
Edison	1,984,385	133,320	2,117,705
Elk Hills	1,614,734	14,151,246	15,765,980
Fruitvale	2,940,855	184,237	3,125,092
Gosford		41,748	41,748
Greeley		5,062,061	5,062,061
Helm		1,212,336	1,212,336
Jacalitos		1,166,825	1,166,825
Kern Front	3,367,012		3,367,012
Kern River	3,566,518		3,566,518
Kettleman Hills		14,362,403	14,362,403
Lanare		189,484	189,484
Lost Hills	724,120	503,621	1,227,741
McClung		23,741	23,741
McKittrick	1,850,056	171,730	2,021,786
Midway-Sunset	9,261,188	5,245,624	14,506,812
Mountain View	11,714	1,004,574	1,016,288
Mount Poso	6,710,811		6,710,811
Paloma		848,841	848,841
Panoche Hills		150	150
Pleasant Valley		1,305,601	1,305,601
Poso Creek	1,292,215		1,292,215
Pyramid Hills	131,200		131,200
Race Track		213,086	213,086
Raisin City		1,165,565	1,165,565
Rio Bravo		5,728,706	5,728,706
Riverdale		1,540,224	1,540,224
Round Mountain	2,319,627	573,854	2,893,481
Santiago	22,544	86,973	109,517
Sheep Springs		196,526	196,526
Strand		839,271	839,271
Tejon	162,495	55	162,550
Ten Sections		4,094,758	4,094,758
Union Avenue	37,906		37,906
Wasco		501,398	501,398
Wheeler Ridge		85,233	85,233

TABLE E—Continued

Production of Light and Heavy Oils, by Fields, for 1945

Field	Under 20° (barrels)	20° and above (barrels)	Total (barrels)
COASTAL			
Aliso Canyon	9,229	1,144,849	1,154,078
Arroyo Grande	27,197		27,197
Capitan		794,202	794,202
Casmalia	129,072		129,072
Cat Canyon	2,992,936		2,992,936
Del Valle		2,038,167	2,038,167
Elwood		2,171,254	2,171,254
Gato Ridge	1,682,879		1,682,879
Lompoc	459,973	94,718	554,691
Newhall		24,752	24,752
Newhall-Potrero		1,992,732	1,992,732
Oak Canyon		744,470	744,470
Orcutt		1,331,671	1,331,671
Padre Canyon		751,408	751,408
Rincon		1,684,703	1,684,703
San Miguelito		1,940,058	1,940,058
Santa Barbara	33,044		33,044
Santa Maria Valley	13,459,416		13,459,416
Summerland	186		186
Ventura Avenue		17,698,240	17,698,240
Ventura County	492,151	2,071,966	2,564,117
Watsonville	9,125		9,125
SOUTHERN CALIFORNIA			
Brea-Olinda	284,485	4,062,856	4,347,341
Buena Park		38,239	38,239
Coyote—East	219,220	1,614,025	1,833,245
Coyote—West		5,217,517	5,271,517
Dominguez		6,726,464	6,726,464
El Segundo	161,769	124,816	286,585
Huntington Beach	2,069,640	15,511,329	17,580,969
Inglewood	216,084	5,407,841	5,623,925
Lawndale		8,468	8,468
Long Beach	108,577	9,716,657	9,825,234
Los Angeles	58,892		58,892
Montebello	6,664	3,658,057	3,664,721
Newport	378,371	5,140	383,511
Playa del Rey	91,312	808,091	899,403
Potrero		380,441	380,441
Richfield	842,850	1,898,059	2,740,909
Rosecrans		2,095,338	2,095,338
Salt Lake	120,121		120,121
Santa Fe Springs	2,013	6,275,163	6,277,176
Seal Beach		3,425,518	3,425,518
Torrance—Hermosa	2,171,604	1,068,139	3,239,743
Turnbull Canyon	7,760	57,415	65,175
Whittier	250,858	137,147	388,005
Wilmington	10,136,959	26,056,165	36,193,124
Grand totals	82,371,227	243,739,362	326,110,589

Oil in "Storage"

Field, refinery, pipe-line and tank-farm stocks of crude and refined products in the Pacific Coast [1] territory totaled 71,285,295 barrels on December 31, 1945, as compared with 85,181,355 barrels on December 31, 1944, with a total decrease in stock from the preceding year of 13,896,060 barrels. Table F gives a breakdown of stocks as of December 31, 1944 compared with December 31, 1945.

[1] American Petroleum Institute: Summary of California Oilfield Operation for December, 1945.

TABLE F

	December 31, 1944 (barrels)	December 31, 1945 (barrels)
1. Gasoline-bearing crude	20,268,738	18,721,076
2. Nongasoline-bearing crude	6,054,501	4,488,510
3. Unblended natural gasoline, L. P. G. & Cycle Condensate	1,437,344	1,048,383
4. Gasoline (except distributing and service stations)	10,779,164	12,670,064
5. Naptha distillates	[a]5,522,603	[a]3,141,768
6. Gas oil and diesel oil	10,170,286	8,044,746
7. Fuel oil residuum	26,012,283	18,103,572
8. All other stocks	[b]4,936,436	[b]5,067,176
Totals	85,181,355	71,285,295
[a] Estimated unfinished gasoline contained in Item No. 5	4,780,825	2,612,412
[b] Coke included in Item No. 8	151,587	382,409

Utilization of California Crude Oil

Most of the crude oil produced in California is sent to storage reservoirs at tank farms near the oil fields and from these reservoirs by pipe lines to the refineries, the larger ones of which are located in the vicinity of Los Angeles and on San Francisco Bay.

During 1944 the crude oil consumed in California according to the U. S. Bureau of Mines[1] was 307,483,000 barrels sent to stills at the refineries; 7,681,000 barrels used for cracking; 18,944,000 barrels were either consumed as fuel or added to residuum; and 3,906,000 barrels shipped outside of the State; and for the year stocks were depleted by 3,193,000 barrels from 1944, compared with 1944 when 289,708,000 barrels were sent to the stills; 5,007,000 barrels were used for cracking; 25,627,000 barrels either were consumed as fuel or added to residuum; 5,286,000 barrels were shipped from the State; and stocks were depleted by 10,852,000 from the previous year.

The production of petroleum products during 1944 and 1945 is shown in Table G:

TABLE G

Commodity	1944 Amount in barrels	1945 Amount in barrels
Crude petroleum to stills	289,708,000	307,483,000
Crude petroleum used for cracking	5,007,000	7,681,000
Natural gas gasoline	15,066,000	15,554,000
Gasoline and naptha distillates	111,074,000	119,297,000
Kerosene and kerosene distillates	4,207,000	4,277,000
Lubricating oils and greases	3,886,000	3,778,000
Gas oil and diesel oil	37,888,000	37,956,000
Fuel oil, residuum and nongasoline crude[a]	126,366,000	137,789,000
Asphalt and road oil	9,122,000	8,709,000
Totals[b]	309,781,000	330,718,000
[a] Includes heavy non gasoline crude oil	24,627,000	18,944,000
[b] Total of crude oil and natural gasoline.		

[1] Knudsen, E. T., The Petroleum Situation in the Pacific Coast Territory (monthly) 1945, U. S. Bureau of Mines.

Operating Data

The following tabulation (Table H, page 30) is compiled from data published by the State Division of Oil and Gas,[1] semiannually, and here combined to show the entire year's operations for all fields. The districts are the geographical subdivisions as administered by that Division and which are outlined on the accompanying map.

It will be noted that the State average yield of oil per-well-per-day was 75.0 barrels for the first six months of 1945 and 71.8 barrels for the second. This is somewhat higher than the figure 37.3 barrels average for December derived from American Petroleum Institute data as shown in Table D, on a previous page, owing in part at least, to the fact that the latter is on a full-time basis, whereas the division's figures allow for shutdown time.

[1] Summary of Operations—California Oil Fields; Division of Oil and Gas, Fifteenth Annual Report of State Oil and Gas Supervisor, Vol. 31, No. 1, Jan.-June, 1945, and No. 2, July-Dec., 1945.

TABLE H

Production Statistics and Operating Data of California Oil Fields—1945

Field	January 1 to June 30				July 1 to December 31				Cumulative production of oil (bbls.) to end 1945	Proved acreage as of Dec. 31, 1945
	Average number of producing wells—actual	Oil (bbls.)	Production per well per day (bbls.)	Percentage of time wells produced	Average number of producing wells—actual	Oil (bbls.)	Production per well per day (bbls.)	Percentage of time wells produced		
DIST. 1—Aliso Canyon	28	590,164	158.1	73.7	30	563,161	138.0	73.9	5,432,403	380
Beverly Hills	2	20,208	58.7	94.8	2	20,524	55.9	99.7	4,546,139	15
Brea-Olinda	387	2,156,048	33.1	93.1	355	2,057,231	33.3	94.6	185,193,928	1,363
Coyote, East	179	1,085,805	35.0	95.7	177	997,248	32.5	94.2	[1]54,077,699	1,170
Coyote, West	177	2,392,484	80.8	92.5	188	2,878,839	87.8	94.8	143,356,741	938
Del Valle	40	906,714	142.2	88.1	47	1,138,992	140.8	93.5	5,689,557	540
Dominguez	311	3,472,054	62.8	98.2	315	3,267,530	58.5	96.4	162,366,943	1,243
El Segundo	34	141,581	24.2	95.1	31	132,001	24.7	93.8	11,547,737	433
Huntington Beach	815	8,935,482	63.4	95.5	825	8,668,400	59.8	95.4	360,739,199	3,160
Inglewood	306	2,901,236	54.4	96.3	306	2,721,467	50.4	95.9	152,070,600	850
Lawndale	3	4,227	7.9	98.2	2	3,461	9.6	98.4	1,142,717	15
Long Beach	1,138	4,971,278	25.0	96.4	1,133	4,823,954	24.1	96.0	[1]706,552,200	1,213
Los Angeles City	91	38,741	2.4	97.2	91	38,151	2.3	97.6	54,475,250	250
Montebello	345	1,882,193	31.5	95.6	348	1,777,299	29.1	95.5	142,623,546	1,400
Newhall	13	11,691	5.1	97.0	13	12,136	5.5	92.8	[3]5,934,827	355
Newhall-Potrero	37	956,166	150.3	95.0	41	1,038,484	140.4	98.1	9,468,306	565
Newport, West	4	22,373	40.6	76.0	32	335,089	67.4	84.4	365,847	278
Newport, West					[21]					
Oak Canyon	13	365,861	174.1	89.3	15	373,381	150.4	89.9	1,643,353	220
Playa del Rey	124	457,116	20.9	97.3	120	431,646	20.4	96.0	49,810,872	475
Potrero	24	175,883	43.6	92.8	25	206,105	47.7	94.0	5,552,080	140
Richfield	314	1,304,748	23.6	97.2	318	1,325,854	23.6	96.1	105,484,592	1,260
Rosecrans	179	1,069,116	34.0	97.1	182	1,013,029	34.3	88.2	57,776,070	745
Salt Lake	8	40,221	29.9	92.8	8	37,274	30.5	82.9	7,770,139	18
Santa Fe Springs	555	3,208,478	33.0	96.8	552	3,071,558	31.6	95.8	505,820,248	995
Seal Beach	146	1,631,738	66.4	93.0	152	1,780,845	66.6	95.6	101,878,390	495
Torrance	684	1,600,887	13.6	95.4	702	1,660,297	13.6	94.7	[1]115,298,733	4,935
Turnbull	5	30,045	35.1	94.7	5	27,370	30.5	97.4	386,330	65
Whittier	161	187,787	7.0	92.2	163	201,443	7.1	94.3	20,535,710	595
Wilmington	1,334	18,047,663	77.1	97.0	1,408	18,125,370	72.3	96.7	281,598,191	5,065
Los Angeles County:										
Buena Park Area					1	831	207.8	100.0	831	10
East Los Angeles Area					1	368	184.0	5.7	368	10
Hyperion Area	1	6,300	38.4	90.6	1	6,068	36.6	90.2	19,529	10
Puente Area	1	210	4.4	26.5	0	0	0	0	1,885	0
Simi Area					1	505	6.5	84.8	505	10
Western Avenue Area	2	4,759	15.1	87.0	3	5,098	11.8	78.4	33,946	30

Whittier Heights Area	3	4,484	10.1	82.0	4	3,843	5.5	94.4	10,584	20
Orange County: Buena Park Area	2	20,835	57.9	99.4	2	16,564	46.1	97.6	160,950	20
Totals	7,466	58,644,576	45.3	95.8	7,599	58,701,416	44.1	95.4	3,259,366,945	29,286
Imperial Carbon Dioxide Gas	10				12					135
DIST. 2—Bardsdale	172	413,970	14.5	91.4	165	384,713	13.7	92.8	16,149,581	995
Ojai	68	22,967	2.2	86.2	68	22,594	2.1	87.9	3,321,595	410
Oxnard	5	204,989	267.6	84.6	4	202,603	287.8	95.7	1,511,456	140
Piru	84	204,643	15.6	86.3	84	195,233	14.1	89.8	9,733,446	705
Rincon	144	2,208,945	91.6	92.5	158	2,158,960	84.3	88.1	35,893,245	955
Santa Paula	20	8,859	3.0	55.6	20	10,684	4.0	49.6	2,273,229	455
Sespe	24	32,289	11.0	67.3	25	32,304	9.8	71.3	3,231,048	380
Simi	54	13,511	1.4	96.5	54	13,402	1.4	96.2	2,261,521	620
South Mountain	107	335,196	18.9	91.8	111	469,243	24.3	94.5	25,007,035	910
Ventura	514	8,873,602	107.4	88.8	506	8,829,570	105.6	89.8	303,003,761	2,470
Totals	1,201	12,318,971	63.9	88.7	1,204	12,310,306	63.6	89.3	402,416,517	8,040
DIST. 3—Arroyo Grande	8	11,329	9.7	80.4	9	17,624	14.4	73.8	1,338,984	200
Capitan	51	432,413	48.2	97.2	46	361,607	51.2	83.5	9,550,475	220
Casmalia	7	63,721	55.3	90.9	14	62,030	54.6	44.1	15,129,963	740
Cat Canyon	94	2,285,503	149.6	89.8	101	2,315,342	136.6	91.2	39,098,676	2,980
Elwood	64	1,067,926	93.4	98.7	62	1,106,042	99.0	90.0	75,224,881	469
La Goleta Gas	[28]				[28]					400
Lompoc	29	291,106	57.1	97.1	30	258,252	49.9	93.8	12,405,937	3,060
Mesa	15	14,978	6.2	89.6	15	18,663	7.5	89.6	3,516,073	22
Moody Gulch	1	220	6.5	18.8	0	0	0	0	60,589	10
Santa Maria	200	688,353	19.7	96.7	199	642,608	18.2	96.2	102,889,576	4,420
Santa Maria Valley	371	6,823,501	114.0	89.1	400	6,641,016	98.8	91.4	62,888,580	5,935
Sargent	9	3,348	3.7	55.2	9	3,768	2.6	85.9	781,229	80
Summerland	0	0	0	0	0	0	0	0	3,179,957	10
Santa Barbara County: Zaca Area	1	21,676	216.8	55.2	1	45,675	234.2	100.0	67,351	80
Totals	850	11,704,074	82.8	92.2	886	11,472,627	76.8	91.7	326,132,554	18,620
DIST. 4—Antelope Hills	27	357,499	94.0	77.8	27	324,194	76.6	85.2	2,214,495	245
Ant Hill	8	74,611	66.3	77.8	16	142,682	56.0	80.6	234,423	240
Belridge, North	66	1,252,747	134.7	77.8	66	1,077,173	113.0	78.5	51,125,891	1,825
Belridge, South	713	2,389,057	19.7	94.0	732	2,239,423	17.6	94.7	36,533,452	5,505
Blackwells Corner	15	29,111	13.9	76.9	19	30,474	10.5	82.7	99,199	145
Canal	34	639,237	128.1	81.1	32	601,969	119.6	85.5	11,623,963	780
Canfield Ranch	3	13,877	48.0	53.2	3	39,755	77.5	92.9	195,255	50
Coles Levee, North	76	2,053,504	207.3	93.0	80	3,456,065	241.3	97.3	25,693,603	2,710
Coles Levee, North	[22]				[22]					
Coles Levee, South	30	480,571	102.0	86.7	40	539,132	97.0	75.5	8,314,009	3,070
Coles Levee, South	[23]				[23]					
Devils Den	4	2,120	5.8	47.9	5	4,208	6.5	70.4	[4]102,391	140
Edison	155	761,858	29.6	91.8	175	1,619,675	56.8	88.6	[4]14,023,378	2,125
Elk Hills	432	10,585,352	150.6	89.9	329	5,171,740	108.4	78.8	190,325,958	12,510
Elk Hills	[20]				[21]					
Fruitvale	194	1,538,470	53.	84.6	190	1,562,214	50.6	88.3	[4]36,011,696	2,040

TABLE H—Continued

Production Statistics and Operating Data of California Oil Fields—1945

Field	January 1 to June 30				July 1 to December 31				Cumulative production of oil (bbls.) to end 1945	Proved acreage as of Dec. 31, 1945
	Average number of producing wells—actual	Oil (barrels)	Production per well per day (bbls.)	Percentage of time wells produced	Average number of producing wells—actual	Oil (barrels)	Production per well per day (bbls.)	Percentage of time wells produced		
Dist. 4—Greeley	92	2,629,540	180.1	87.7	93	2,431,009	168.2	84.4	24,150,845	1,970
Kern Front	560	1,609,551	16.6	95.7	573	1,570,030	15.6	95.6	59,243,888	3,965
Kern River	2,198	1,787,339	4.7	96.2	2,213	1,784,243	4.6	95.7	[4]288,556,401	7,120
Lost Hills	375	619,798	9.4	96.7	380	608,859	9.0	96.9	56,555,173	2,390
McKittrick-Temblor	332	1,013,792	17.4	97.0	353	1,272,417	20.5	95.5	99,933,937	2,225
Midway-Sunset	3,674	14,940,979	23.8	94.3	3,749	15,316,477	23.5	94.6	1,003,215,258	[5]43,015
Midway-Sunset	[2]0				[2]14					
Mt. Poso	476	3,429,698	41.3	91.9	478	3,282,406	38.7	96.4	[4]85,586,639	2,900
Mountain View	142	519,690	22.4	90.3	134	499,360	22.3	90.7	45,978,907	1,735
Paloma	20	1,180,349	427.5	76.3	28	1,440,460	343.8	81.3	[4]4,640,868	4,110
Paloma	[2]2				[2]1					
Poso Creek	184	789,256	25.2	94.1	188	732,903	22.7	93.4	[4]9,427,523	1,765
Rio Bravo	97	2,982,555	177.7	95.6	96	2,775,839	164.2	95.7	33,427,729	1,870
Round Mountain	297	1,748,046	33.6	96.7	316	1,761,407	31.6	95.9	46,731,841	2,230
Strand	23	428,569	125.2	82.2	23	410,022	107.9	89.8	3,987,153	380
Tejon	11	72,616	39.5	92.3	17	88,190	31.3	90.0	327,886	350
Ten Section	114	2,203,796	122.6	87.1	117	1,890,964	105.4	83.4	35,673,201	1,880
Wasco	12	278,179	148.9	86.0	10	222,487	136.2	88.8	4,280,519	250
Wheeler Ridge	34	42,604	7.1	97.3	34	42,560	7.0	97.7	4,314,159	230
Kern County:										
Bellevue Area	3	101,594	226.8	82.5	3	94,544	175.7	97.5	354,174	60
Comanche Point Area	1	55	7.8	3.9					55	0
McClung Area	1	16,801	97.1	95.6	2	4,332	16.0	73.6	4,332	10
Rosedale Ranch Area	1	9,470	99.7	52.5	1	7,148	41.3	94.0	90,271	10
Shafter Area	1	76	5.8	7.2	3	23,942	52.2	83.2	33,412	80
Bowerbank Gas	[2]2				[2]1					1,360
Buttonwillow Gas	[2]7				[2]10					1,200
Semitropic Gas	[2]8				[2]7					1,600
Trico Gas	[2]17				[2]20					5,800
Totals	10,405	57,227,367	32.3	94.1	10,525	53,068,303	29.2	93.9	2,183,011,829	119,890
Dist. 5—Coalinga	1,416	5,373,431	52.9	95.9	1,385	5,021,260	21.0	94.0	405,178,010	15,712
East Coalinga Extension	201	11,076,084	314.5	96.8	202	10,137,082	287.0	95.0	98,186,583	4,130
Helm	32	567,472	111.1	88.2	49	837,181	106.7	87.0	2,222,234	4,185
Jacalitos	41	494,086	78.9	84.4	52	730,763	82.0	93.1	3,730,034	1,245
Kettleman Middle Dome	0	0	0	0.0	0	0	0	0.0	552,036	0
Kettleman North Dome	282	7,184,812	157.4	89.4	283	7,169,044	149.3	92.2	310 329,530	13,075

Pleasant Valley	20	626,853	207.1	83.6	20	678,630	190.9	96.6	2,482,784	460
Pyramid Hills	20	72,005	20.3	97.9	21	63,335	17.4	94.4	209,178	130
Raisin City	32	607,633	114.1	92.0	32	551,836	102.4	91.6	2,837,689	960
Riverdale	47	838,417	106.8	92.2	49	703,609	86.2	90.6	3,765,988	1,555
Fresno County:										
Burrel Area	2	8,471	28.0	83.4	2	3,890	19.7	53.5	25,122	20
Cantua Creek Area	0	0	0	0	0	0	0	0	3,146	10
Cheney Ranch Area	0	0	0	0	0	0	0	0	4,798	10
Eureka Gas	[2]3				[2]3					480
Fairfield Knolls Gas	[2]0				[2]1					240
Gill Ranch Gas	[2]4				[2]5					810
Marysville Buttes Gas	[2]5				[2]6					840
McDonald Island Gas	[2]5				[2]5					1,060
Ord Bend Gas	[2]1				[2]2					210
Rio Vista Gas	[2]82				[2]92					[4]21,750
Roberts Island Gas	[2]1				[2]1					20
Tracy Gas	[2]2				[2]1					310
Vernalis Gas	[2]2				[2]2					100
Willows Gas	[2]1				[2]0					20
Butte County: Chico Area	[2]0				[2]0					20
Colusa County:Colusa Area	[2]0				[2]0					20
Glenn County: Afton Area	[2]0				[2]0					40
Kings County: Trico Northwest Area	[2]1				[2]0					20
Madera County:										
Chowchilla Area	[2]0				[2]0					80
Moffatt Ranch Area	[2]0				[2]0					20
Sacramento County: Thornton Area	[2]0				[2]1					1,555
San Joaquin County:										
Lodi Area	[2]0				[2]0					580
Thornton Area	[2]0				[2]0					475
Solano County:										
Cache Slough Area	[2]1				[2]1					260
Honker Area	[2]1				[2]1					20
Kirby Hill Area	[2]1				[2]0					80
Maine Prairie Area	[2]1				[2]1					40
Millar Area	[2]0				[2]1					20
Suisun Area	[2]1				[2]1					40
Sonoma County: Petaluma Area	[2]0				[2]0				3,304	20
Tehama County: Corning Area	[2]0				[2]0					20
Totals	2,093	26,849,264	75.0	94.5	2,095	25,896,630	71.8	93.5	829,530,436	70,642
Grand totals	22,015	166,744,252			22,309	161,518,282			7,000,458,281	246,619

[1] Includes adjustments to prior totals.
[2] Dry gas wells omitted from totals.
[3] Total cumulative production figure adjusted to include production prior to 1903 as agreed upon by the Reserves Committee of the American Petroleum Institute, Conservation Committee of the California Oil Producers, and the Division of Oil and Gas (See also "Summary of Operations, California Oil Fields," Vol. 20, No. 2, page 56).
[4] Corrected figure.
[5] Includes 100 acres in San Luis Obispo County, District No. 3.
[6] Includes 953 acres in Contra Costa County, District No. 3.

Proved Oil Land

The total proved oil land and natural gas land in California as of December 31, 1945, 246,619 acres an increase of 13,122 acres during the year 1945, according to data furnished by the Division of Oil and Gas.[1] The acreage as of December 31, 1944 and December 31, 1945 by counties, is given in the following, Table I

TABLE I
Proved Oil and Natural Gas Land

County	Acres Dec. 31, 1944	Acres Dec. 31, 1945
Butte	20	20
Colusa	20	20
Contra Costa	730	953
Fresno	30,678	33,049
Glenn	220	270
Humboldt	480	480
Imperial*	210	135
Kern	108,760	114,790
Kings	8,224	8,468
Los Angeles	20,369	21,007
Madera	510	905
Orange	7,616	8,279
Sacramento	11,410	13,284
San Joaquin	2,960	2,495
San Luis Obispo	300	300
Santa Barbara	18,242	18,336
Santa Clara	90	90
Solano	8,700	9,528
Sonoma	20	20
Stanislaus	50	50
Sutter	840	840
Tehama	20	20
Tulare	5,000	5,000
Ventura	7,788	8,040
Yolo	240	240
Totals	233,497	246,619

* Carbon dioxide gas only.

[1] Summary of Operations—California Oil Fields; Division of Oil and Gas, Fifteenth Annual Report of State Oil and Gas Supervisor, Vol. 24, No. 4, July-Dec., 1945.

CHAPTER THREE

METALS

Bibliography: Reports of State Mineralogist I-XLII (inc.). Bulletins 5, 6, 18, 23, 27, 36, 50, 57, 76, 78, 85, 92, 95, 108, 125, 129, 130, 134. Spurr and Wormser, "Marketing of Metals and Minerals." See also under each metal.

The value of metals produced in California during 1945 amounted to a total of $16,928,007, as compared with $24,040,256 in 1944. Increases in total values over those of 1944 were registered by gold, lead, platinum group metals, silver, and zinc, all others showed a decline in output. Gold again lead all metals in value of total output for the year; the position it held as far back as a record of production has been kept in California, with the exception of 1943, when its value was exceeded by quicksilver and tungsten ore, and 1944, when it was passed by tungsten ore only.

A comparison of the 1944 output with that of 1945 is afforded by the following table:

Substance	1944		1945		Increase+ Decrease— Value
	Amount	Value	Amount	Value	
Chromite	27,900 long tons	$1,190,513	9,784 long tons	$431,445	$759,068—
Copper	25,584,865 lbs.	3,453,957	13,949,675 lbs.	1,883,206	1,570,751—
Gold	117,373 fine ozs.	4,108,055	147,938 fine ozs.	5,177,830	1,069,775+
Iron ore	905,981 tons	2,360,694	240,917 tons	883,434	1,477,260—
Lead	11,408,381 lbs.	912,670	14,504,767 lbs.	1,247,410	334,740+
Manganese ore	30,263 long tons	1,098,555	1,875 long tons	86,270	1,012,285—
Platinum group metals			145 fine ozs.	6,719	6,719+
Quicksilver	28,097 flasks	3,178,969	21,062 flasks	2,697,835	481,134—
Silver	775,936 fine ozs.	553,910	986,798 fine ozs.	701,723	147,813+
Tungsten ore	203,965 units	4,835,810	71,511 units	1,587,951	3,247,859—
Zinc	16,456,103 lbs.	1,875,996	19,340,732 lbs.	2,224,184	348,188+
Unapportioned	[a]	471,127			471,127—
Total values		$24,040,256		$16,928,007	
Net decrease					$7,112,249

[a] Includes antimony, cadmium, molybdenum ore, tin ore, and titanium ore.

ALUMINUM

Bibliography: Report XVIII, p. 198, XXXVII. Bulletins 38, 67, 130. U. S. Geol. Surv., Min. Res. of U. S.

To date no commercial production of aluminum ore has been made in California. Only a single authenticated occurrence of bauxite has thus far been noted in this State, being in Riverside County southeast of Corona, but as yet undeveloped.

Aluminum metal has been reduced in the State in two plants, one at Torrance in Los Angeles County, which started production in 1942, and the other at Riverbank, Stanislaus County, which went into operation in May 1943. Both plants were closed down in August of 1944. These plants were constructed by the Defense Plant Corporation and operated by Aluminum Company of America. The ore from which the metal was made was South American Bauxite, which was refined to

alumina (aluminum oxide) in Mobile, Alabama, before being shipped to these plants.

Minerals containing aluminum are abundant, the most widely distributed being the clays. Only two are however, thus far of consequence commercially, in the production of metal; bauxite (to which may be added the related hydrated oxides, hydrargillite and diaspore) and cryolite. Cryolite is found in commercial quantities only in south Greenland, and was formerly the only ore of aluminum used, being still employed as a flux in the extraction of the metal. Bauxite has been for some years the most important source of aluminum and its salts. Its color varies from gray to red, according to the amount of iron present, the composition ranging usually between the following limits: Al_2O_3, 30%–60%; Fe_2O_3. 3%–25%; SiO_2, 0.5%–20%; TiO_2, 0.0–10%. Besides its reduction to the metal bauxite is also utilized in the manufacture of aluminum salts, refractories, alundum (fused alumina) as an abrasive, and in the refining of oil.

ANTIMONY

Bibliography: State Mineralogist Reports VIII, X, XII-XV (inc.). XVII, XXII, XXIII, XXV-XXVII (inc.), XXXI, XXXIV, XXXVI. Bulletins 38, 91, 130.

During 1945 in California no antimony ore was reported shipped. In 1944 two small shipments of ore were made from a single property each in Inyo and Kern counties. The annual details are concealed under the 'Unapportioned' item so as not to reveal the output of either operator.

Pure antimony metal and manufactured antimony compounds are of considerable importance as pigments in the ceramic industry. The most important use of the metal, commercially, is in various alloys, particularly type-metal (with tin and lead), babbitt (with tin and copper), and britannia metal (with tin and copper). An alloy of 6% antimony and 94% lead is being extensively used in making battery plates for storage batteries for automobiles, airplanes and radio apparatus.

Present New York quotations (Sept. 12, 1946) are around 16.5¢ per pound for Chinese (duty paid) and 15.839¢ for domestic antimony.

Antimony Production in California, by Years

The production of antimony ore in California by years since 1887 has been as follows:

Year	Tons	Value	Year	Tons	Value
1887	75	$15,500	1918		
1888	100	20,000	1925	*26	$770
1889			1926		
1893	50	2,250	1927	20	590
1894	150	6,000	1928	20	761
1895	33	1,485	1929		
1896	17	2,320	1939	150	4,552
1897	20	3,500	1940	*28	7,958
1898	40	1,200	1941	*10	2,537
1899	75	13,500	1942	*30	9,251
1900	70	5,700	1943		
1901	50	8,350	1944	*	*
1902	510	35,666	1945		
1916	1,015	64,793			
1917	158	18,786	Totals	2,647	$225,469

* Annual details concealed under 'Unapportioned.'
* Beginning 1940, amount of recoverable metal; before, tons of antimony ore shipped.

ARSENIC

Bibliography: Reports XVIII, XXIII, XXV, XXX, XXXIII, XXXV. Bulletins 67, 130. U. S. G. S., Min. Res. of U. S.

Arsenic is found in a number of localities in California in the mineral arsenopyrite (FeAsS), which is frequently gold bearing; and in scorodite ($FeAsO_4+2H_2O$), an oxidation product of arsenopyrite. The occurrence of realgar (AsS) has also been noted.

Except for a small output in 1924, there has been no commercial recovery of arsenic from California ores. There having been only a single operator, the figures are concealed under the 'Unapportioned' item.

BERYLLIUM

Bibliography: State Mineralogist Report XXVII, XXXV, XXXVI, Eng. & Min. Jour.-Press, Vol. 118, No. 8, p. 285, Aug. 23, 1924. U. S. Bureau of Mines Information Circular 6190.

Beryllium is a metal resembling aluminum closely in its chemical character. It has a specific gravity of 1.85, is almost as hard as quartz (will scratch glass) and will take a high polish. The uses of beryllium in fabricated products include beryllium-copper rod available in diameters up to 3 inches, and wire drawn to a minimum 10/1000 inch; also drawn tubing. A new development is the use of beryllium-copper in cast-setting diamond core bits and reaming shells. In recent years a mechanical setting method has been developed that permits a very large number of small diamonds to be set in drill bits at perfectly spaced intervals. A typical bit may contain 178 stones having an aggregate weight of 7 carats. Instead of setting stones by hand, methods for casting metal around the stones have been developed. The new bit composition "Vankolito," is a beryllium-copper alloy and is claimed to have among other advantages increased tensile strength and improved holding qualities. Among other uses are: beryllium-aluminum light alloys being developed for aircraft; metalic beryllium used for x-ray tubes; beryllium oxide used in fluorescent lamps, luminous paints, special refractories, abrasive compounds, and dental cement; beryllium-nitrate used by incandescent-mantle manufacturers to harden the thorium oxide skeleton. Beryllium sulfide has been used in medical research and is also said to stimulate the growth of certain seeds. Ground raw beryl is used in ceramics.

There are a number of beryllium minerals, but none have been found in commercial quantities, except beryl, which is beryllium-aluminum silicate. The chief use at present for ground beryl is as an addition to porcelain products, where it reduces the coefficient of expansion. Beryllium metal is difficult to separate from aluminum.

Present (Sept. 12, 1946) quotations for beryllium ore are per short ton unit in carload lots, 8 to 12 percent BeO $8 to $10, f.o.b. mine.

Beryl occurs in California in the pegmatite dikes of the tourmaline gem district in northern San Diego and southwestern Riverside Counties; and an occurrence has recently been noted in western Inyo County, but the quantity is as yet unproved. Thus far there have been no commercial shipments of beryl from California except for gem purposes (the pink and aquamarine varieties).

BISMUTH

Bibliography: State Mineralogist Report XXXV. Bulletins 38, 67, 91, 130. Am. Jour. Sci., 1903, Vol. 16.

In 1942, several hundred pounds of bismuth concentrates were made at a tungsten mine in Fresno County, but no shipments were made.

Several bismuth minerals have been found in California, notably native bismuth and bismite (the ochre) in the tourmaline gem district in San Diego and Riverside counties near Pala. Other occurrences of bismuth minerals, including the sulphide, bismuthinite, have been noted in Inyo, Fresno, Nevada, Tuolumne, San Bernardino, and Mono counties, but only in small quantities. The only commercial production recorded was 20 tons valued at $2,400 in 1904, and credited to Riverside County.

The uses of bismuth are somewhat restricted, being employed principally in the preparation of medicinal salts, and in low melting-point or cliché alloys. These alloys are utilized in automatic fire sprinkler systems, in electric fuses, and in solders.

The present quotation (Sept. 12, 1946) for bismuth is $1.60 per pound, in ton lots for the refinery metal.

CADMIUM

Bibliography: Bulletin 130. U. S. Geol. Surv., Min. Res. of U. S., 1908, 1918.

In 1944 cadmium metal was recovered from zinc ore shipped from the Big Bend Mine in Butte County, to the Sullivan Mining Company at Silver King, Idaho for reduction. In 1917 and 1918, cadmium was recovered by the electrolytic zinc plant of the Mammoth Copper Company in Shasta County. It was shipped in the form of 'sticks' and amounted to a total of several thousand pounds for the two years, the exact figures being concealed under 'Unapportioned.' That was the first commercial production of cadmium recorded from California ore. Cadmium occurs there associated with zinc sulphide, sphalerite. Cadmium also occurs in the Cerro Gordo Mines, Inyo County, associated with smithsonite (zinc carbonate).

Cadmium is produced in the United States in two forms—metallic cadmium and the pigment, cadmium sulphide. The principal use of the metal is in low-melting point, or cliché alloys, and its salts are utilized in the arts, medicine, and in electroplating. The sulphide is employed as a paint pigment, being a strong yellow, which is unaffected by hydrogen sulphide gas from coal smoke. It is also employed in coloring glass and porcelain. Cadmium cliché metal is stated to be superior to the corresponding bismuth alloy, for making stereotype plates. Cadmium is also used in bronze telegraph and telephone wires, and gives some promise of being utilized in electroplating.

The present quotation (Sept. 12, 1946) for cadmium is $1.25 per pound for the metal.

CHROMITE

Bibliography: State Mineralogist Reports IV, XII, XIII, XIV, XV, XVII, XVIII, XXI-XXIX (inc.), XXXI, XXXIV-XXXIX (inc.), XLI. Bulletins 38, 76, 91, 134. Preliminary Report 3. U.S.G.S., Bull. 430. Min. & Sci. Press, Vol. 114, p. 552.

During 1945 there were shipments from California mines of 9,628 long tons of chromite averaging 45.73% Cr_2O_3, which, recalculated to a basis of 45% Cr_2O_3, equals 9,784 long tons. This was worth $431,445 f.o.b. mine, and came from 30 properties in 10 counties; compared with 28,811 long tons of ore shipped in 1944 averaging 43.58% Cr_2O_3, which recalculated to a basis of 45% Cr_2O_3, equals 27,900 long tons, worth $1,190,513.

Distributed by counties the 1945 shipments were as follows:

County	Long tons of 45% Cr^2O^3	Value
Del Norte	7,244	$309,224
Placer	170	8,625
Siskiyou	470	24,434
El Dorado, Fresno, Humboldt, Placer, San Benito, San Luis Obispo, Shasta, Tehama*	1,900	89,162
Totals	9,784	$431,445

* Combined to conceal the output of individual operators in each.

Some of the material shipped in 1945 was mined in 1944 or before but not previously reported. The chromite shipped during 1945 varied in grade from a shipment running as high as 56.51% Cr_2O_3 from San Benito County to one averaging 40% Cr_2O_3 from Del Norte County and used for refractories. During 1942 and 1943 there were several shipments the grade of which was as low as 32% Cr_2O_3.

The California miner received an average of $44.81 a long ton for chromite shipped in 1945 compared with $41.32 per long ton in 1944; $40.44 per long ton in 1943; and $36.64 per long ton in 1942.

Occurrence

Chromite is widely distributed in California, the principal production, thus far, having come from El Dorado, San Luis Obispo, Del Norte, Shasta, Siskiyou, Placer, Fresno, and Tuolumne counties. In 1918 a total of 29 counties contributed to the State's output. Two main belts in California yield this mineral, one along the Coast Ranges from San Luis Obispo County to the Oregon line, including the Klamath Mountains at the north end, and the other in the Sierra Nevada from Tulare County to Plumas County. Chromite occurs as lenses in basic igneous rocks such as periodite and pyroxenite, and in serpentines which have been derived by alteration of such basic rocks.

Uses

The major consumption of chromite ore is for use as a refractory lining in smelting furnaces for steel and copper. A smaller portion is used in the preparation of ferrochrome for chrome-steel alloys, and of chromium chemicals, the latest development of which is chrome plating as used in the automobile industry, on ships, and in oil refineries to protect metal surfaces from wear and erosion.

Total Chromite Production of California

Production of chromite in California began, apparently in the period 1869-1873 in Del Norte County, followed by San Luis Obispo in 1874. There was considerable activity in San Luis Obispo from 1880 to 1883, inclusive, and a total of 23,238 long tons (or 26,028 short tons) valued at $329,924 was shipped from that county up to the beginning of 1887. There are records of shipments from Sonoma County (before 1883), Placer County (1883 and 1884), and Calaveras County. Apparently the state's total in the period 1869-1883 was some 45,000 tons.[1] The tabulation herewith shows the output of chromite in California annually, including the earliest figures so far as they are available. The figures from 1887 to date are from the records of the State Mining Bureau:

Year	Tons	Value	Year	Tons	Value
1869-1883			1914	1,517	$9,434
Del Norte County, Sonoma County, Placer County, Calaveras County	19,000	$239,400	1915	3,725	38,044
1874-1887 (San Luis Obispo County)	26,028	329,924	1916	48,943	717,244
1887	3,000	40,000	1917	52,379	1,130,298
1888	1,500	20,000	1918	73,955	3,649,497
1889	2,000	30,000	1919	*4,314	97,164
1890	3,599	53,985	1920	1,770	43,031
1891	1,372	20,580	1921	347	6,870
1892	1,500	22,500	1922	379	6,334
1893	3,319	49,785	1923	84	1,658
1894	3,680	39,980	1924	350	6,700
1895	1,740	16,795	1925	191	3,712
1896	786	7,775	1926	393	7,063
1897			1927	225	5,063
1898			1928	729	15,179
1899			1929	327	5,025
1900	140	1,400	1930	84	1,905
1901	130	1,950	1931	441	6,737
1902	315	4,725	1932, 1933 [a]	1,206	16,587
1903	150	2,250	1934	294	3,498
1904	123	1,845	1935	488	6,111
1905	40	600	1936	221	3,314
1906	317	2,859	1937	1,918	20,830
1907	302	6,040	1938	982	10,864
1908	350	6,195	1939	3,936	52,673
1909	436	5,309	1940	2,599	32,796
1910	749	9,707	1941	17,307	355,354
1911	935	14,197	1942	45,253	1,741,080
1912	1,270	11,260	1943	56,201	2,334,838
1913	1,180	12,700	1944	27,900	1,190,513
			1945	10,858	431,445
			Totals	433,277	$12,902,622

* Recalculated to 45% Cr_2O_3 beginning with 1919.
[a] Included under 'Unapportioned.'

[1] Day, D. T., Mineral Res. of the U. S. 1882-1884, U. S. G. S., pp. 569, 570, 1885.

COBALT

Bibliography: Report XIV, XXXIII, XXXIV, XXXVII. Bulletins 67, 91. U. S. G. S., Min. Res. of U. S., 1912, 1918. U. S. B. M., I.C. 6331.

Occurrences of some of the cobalt minerals have been noted in several localities in California, but to date no commercial production has resulted. Some of the copper ores of the foothill copper belt in Mariposa and Madera counties have been found to contain cobalt up to 3%.

The nominal quotation for cobalt (September 12, 1946) is around 97 to 99% at $1.50 per pound for the refined metal in small lots.

The most important use of cobalt is in the manufacture of the alloy, stellite, in which it is combined with chromium, for making high-speed lathe tools, and non-tarnishing cutlery and surgeons' appliances. The metal is also used in electroplating, similarly to nickel; and the oxide, carbonate, chloride, sulphate and other salts are used in ceramics for coloring. Some of the organic salts of cobalt (acetate, resinate, oleate) are employed as 'driers' in paint and varnish.

COPPER

Bibliography: State Mineralogist Reports VIII-XXXIX (inc.). Bulletins 23, 50, 91.

The total output of copper in California during 1945 amounted to 13,949,675 pounds of recoverable metal, valued at $1,883,206 and came from properties in 13 counties. The 1945 production showed a decrease in both amount and value as compared with that of 1944 which was 25,584,856 pounds worth $3,453,957. The average price of copper received by the miner including bonus, during 1945 was 13.5¢ per pound, compared with 13.5¢ in 1944; 13.0¢ in 1943; 12.1¢ in 1942; 11.8¢ per pound in 1941; 11.3¢ per pound in 1940; 10.4¢ per pound in 1939; 9.8¢ in 1938; 12.1¢ in 1937; 9.2¢ in 1936; 8.3¢ in 1935; and 8.0¢ in 1934.

Distribution of the 1945 output of copper in California by counties was as follows:

County	Pounds	Value
Amador	1,619,793	$218,672
Butte	404,572	54,617
Calaveras	3,543,910	478,428
El Dorado	45,284	6,113
Inyo	200,004	27,001
Madera	22,957	3,099
Mariposa	179,848	24,280
San Bernardino	111,254	15,019
Shasta	3,777,988	510,028
Siskiyou	4,042,866	545,787
Kern, Mono, Orange*	1,199	162
Totals	13,949,675	$1,883,206

* Combined to conceal output of producers in each.

According to the U. S. Bureau of Mines[1] the smelter production of primary copper from domestic sources during 1945 totaled 782,726 short tons, compared with 1,003,379 short tons for 1944, or a decrease of approximately 22 percent. The average price of copper during the year as reported to the U. S. Bureau of Mines by selling agents was 11.8¢ per pound f.o.b. refinery but not including bonus payments of the Metal Reserve Company.

Copper Production of California, by Years

Although some mining of copper ores in a small way had been done earlier, shipments in appreciable quantities began in 1861 and continued of importance up to the end of 1867, when a total of 68,631 tons (of 2376 pounds) of high-grade ores, and 847 tons of matte or 'regulus'[2] had been shipped to smelters at New York, Boston, and Swansea, Wales. The most important district at that time was Copperopolis and vicinity in Calaveras County, with some shipments also made from Mariposa, El Dorado, Fresno and San Luis Obispo counties. From 1868 to 1882, the output was insignificant. There are wide discrepancies in the figures recorded for copper production previous to 1882, in which year the data of the U. S. Geological Survey began. The detailed statistics of the California State Mining Bureau began in the year 1894.

Amount and value of copper production in California annually since 1882 is given in the following tabulation:

Copper Production of California, by Years

Year	Pounds	Value	Year	Pounds	Value
1882	826,695	$144,672	1914	30,491,535	$4,055,375
1883	1,600,862	265,743	1915	40,968,966	7,169,567
1884	876,166	120,911	1916	55,809,019	13,729,017
1885	469,028	49,248	1917	48,534,611	13,249,948
1886	430,210	43,021	1918	47,793,046	11,805,883
1887	1,600,000	192,000	1919	22,162,605	4,122,246
1888	1,570,021	235,303	1920	12,947,299	2,382,303
1889	151,505	18,180	1921	12,088,053	1,559,358
1890	23,347	3,502	1922	22,883,987	3,090,582
1891	3,397,405	424,675	1923	28,346,860	4,166,989
1892	2,980,944	342,808	1924	52,089,349	6,823,704
1893	239,682	21,571	1925	46,968,499	6,669,527
1894	738,594	72,486	1926	33,521,544	4,693,014
1895	225,650	21,901	1927	27,350,316	3,582,888
1896	1,922,844	199,599	1928	25,162,304	3,623,360
1897	13,638,626	1,540,666	1929	33,809,258	5,941,799
1898	21,543,229	2,475,168	1930	26,534,752	3,449,522
1899	23,915,486	3,990,534	1931	12,954,842	1,178,890
1900	29,515,512	4,748,242	1932	1,417,536	89,307
1901	34,931,788	5,501,782	1933	992,515	63,521
1902	27,860,162	3,239,975	1934	590,638	47,252
1903	19,113,861	2,520,997	1935	2,031,836	168,645
1904	29,974,154	3,969,995	1936	9,991,799	919,245
1905	16,997,489	2,650,605	1937	10,512,500	1,272,013
1906	28,726,448	5,522,712	1938	1,613,491	158,122
1907	32,602,945	6,341,387	1939	8,390,215	872,582
1908	40,868,772	5,350,777	1940	12.833,363	1,450,170
1909	65,727,736	8,478,142	1941	8,101,449	955,970
1910	53,721,032	6,680,641	1942	2,138,149	258,716
1911	36,838,024	4,604,753	1943	17,172,440	2,232,417
1912	34,169,997	5,638,049	1944	25,584,865	3,453,957
1913	34,471,118	5,343,023	1945	13,949,675	1,883,206
			Totals	1,257,406,648	$195,872,163

[1] U. S. Bureau of Mines Mineral Market Report MMS 1440, July 20, 1946.
[2] Browne, J. Ross, Mineral Resources West of the Rocky Mountains, p. 168. 1867.

GOLD

Bibliography: State Mineralogist Reports I to XLI (inc.), (except III and VIII, XLI). Bulletins 36, 45, 57, 91, 95, 108. U. S. Geol. Surv., Prof. Paper 73. U. S. Bur. of Mines, Econ. Paper 3 (1929).

Gold was first, and, for many years, the most important single mineral product of California. Although now surpassed for a number of years in annual value by petroleum, and by natural gas from 1923 to 1932, and 1943 to 1945, gold headed the metal list till 1943. It was then passed in value by both quicksilver and tungsten ore; and tungsten ore only in 1944. In 1945 gold again lead the metals in value of output. Prior to 1943 California outranked all other gold producing states in the United States for many years.

There was a steady increase in the output of both lode and placer mines in California from 1928 to 1942, but in 1941 the value of placer production continued to increase, although that of lode dropped off 8 percent and in 1942 a sharp decline in the yield of both lode and placer mines, first by the increased difficulty of obtaining supplies and labor and on October 8, 1942, the War Production Board's Order L-208, closing down most of the gold and silver mines in the State. During 1945 there were 87 operating lode properties and 99 placer properties, compared with 109 lode properties and 66 placers in 1944, but these did not include snipers, prospectors, and varous individuals selling gold in small lots to buillon dealers.

The production of gold in California during 1945 totaled 147,938 fine ounces valued at $5,177,830, being an increase of 30,565 fine ounces over the 1944 yield, which was 117,373 fine ounces worth $4,108,055. In 1945 deep or lode mines accounted for 54,458 fine ounces of gold worth $1,906,030, and the placers (mainly bucket-line, drag-line and power shovel dredges) produced 93,480 fine ounces worth $3,271,800.

The 1940 output was the largest in value since 1856 and in amount since 1862. The 1939 lode output of gold was undoubtedly the largest in the history of the State, while the yield of 1944 was the smallest in both amount and value since 1848, the year that gold was discovered in California.

As the Division of Mines has never independently gathered the statistics of gold and silver production, these figures, as in former years, are published by cooperation with and through the courtesy of Alfred L. Ransome of the Division of Mineral Statistics, U. S. Bureau of Mines.

The three leading counties in gold output during 1945 were Nevada, Sacramento, and Yuba, each with a value of production over a million dollars. The gold from Nevada County came chiefly from lode mines, while that from Sacramento and Yuba counties was mainly from bucket-line dredges. In 1943 for the first year since 1880, the year that a segregation of gold by counties was first made, the value of this metal from Nevada and Amador was less than a million dollars; and for Sacramento County since 1908. In 1941 there were 15 counties with a gold output worth more than a million dollars and in 1942 eight counties.

Distribution for the 1945 gold output by counties was as follows:

MINE PRODUCTION BY COUNTIES

County	Mines producing[1]		Fine ounces	Value
	Lode	Placer		
Amador	5	1	476	$16,660
Butte	2	6	4,880	170,800
Calaveras	8	2	2,482	86,870
El Dorado	3	3	676	23,660
Fresno		1	117	4,095
Humboldt		2	51	1,785
Inyo	13		1,844	64,540
Kern	6	2	914	31,990
Los Angeles	1	1	87	3,045
Madera	1		1	35
Mariposa	8	2	3,270	114,450
Merced		2	1,479	51,765
Modoc	1		10	350
Nevada	4	7	33,163	1,160,705
Orange	1		13	455
Placer	1	9	1,212	42,420
Plumas	4		28	980
Sacramento		7	32,851	1,149,785
San Bernardino	12	1	1,060	37,100
San Francisco		[2]	12	420
San Joaquin		2	7,343	257,005
Santa Cruz	1		2	70
Shasta	4	4	4,794	167,790
Sierra	3	7	4,848	169,680
Siskiyou	4	13	2,667	93,345
Stanislaus		2	7,544	264,040
Trinity	2	18	1,824	63,840
Tuolumne	3	1	4,696	164,360
Yuba		6	29,594	1,035,790
Totals	87	99	147,938	$5,177,830

[1] Excludes itinerant prospectors, snipers, high-graders, and others who gave no evidence of legal right to property.

[2] Output from property not classed as a "mine."

The following is quoted from the advance statement of gold in 1945 by courtesy of the U. S. Bureau of Mines,* Department of the Interior:

"*Gold.*—An uninterrupted rise beginning in 1929 culminated in the production of $50,948,485 in gold in 1940, the largest value since 1856. In 1941, however, a reaction set in that gained headway in 1942. By January 1943, monthly production had sunk to 16,425 fine ounces, and until November 1945 it fluctuated between that figure and a low of 8,547 ounces established in February 1943. In 1945 the rescinding of WPB Limitation Order L-208 effective July 1 and the end of the Japanese phase of World War II on August 14 paved the way toward a marked increase in the production of gold. Monthly production in 1945, which remained within narrow limits the first 8 months, showed an unmistakable trend upward commencing in September, and the monthly average for the year was 12,328 ounces compared with 9,781 ounces for 1944. The expected sharp gain did not materialize as rapidly as some had predicted owing to the many interrelated problems of reconversion plus the factors of rising costs, the difficulty of obtaining adequate labor and supplies, and the fixed price of gold. Placer mining accelerated rapidly, but lode gold mining, except for increased production at most properties already in operation, was slower in becoming reestablished, and many of the mines that were large producers before the war had not reopened by the end of 1945.

"The monthly production figures since January 1937 through the war years have been discussed in detail in this chapter for 1944; however, because of the importance to the gold-mining industry of the termination of Order L-208, it is of interest to review briefly the course of gold production during the period centering about the months

* U. S. Bureau of Mines Mineral Year Book of 1945 (Chapter reprint) Gold, Silver, Copper, Lead and Zinc in California, pp. 5-7.

when the order was in effect. Monthly production of gold in California declined approximately 4 percent a month fairly regularly from January 1941 to May 1942, when the downward trend greatly accelerated and continued at about 16 percent a month to December 1942. Strangely, the period when WPB Order L-208 was becoming effective did not mark a substantial change in the trend. Apparently economic forces were curtailing gold production so rapidly in 1942 that exercise of Federal authority was not needed to accomplish a most drastic curtailment of gold mining in California.

"The 25 leading gold-producing mines in California in 1945, listed in the following table, yielded 92 percent of the total gold output of the State; the leading 5 mines produced 65 percent and the leading 10 mines 77 percent."

Twenty-five Leading Gold-producing Mines in California in 1945, in Order of Output

Rank	Mine	District	County	Rank in 1944	Operator	Source of gold
1	Yuba Unit	Yuba River	Yuba	1	Yuba Consolidated Gold Fields	Dredge
2	Natomas Co.	Folsom	Sacramento	2	Natomas Co.	Dredge
3	Idaho Maryland and Brunswick	Grass Valley-Nevada City	Nevada	4	Idaho Maryland Mines Corporation	Gold ore
4	Empire Star group	Nevada City	Nevada	3	Empire Star Mines Co., Ltd.	Gold ore
5	Lower Comanche dredge	Comanche	San Joaquin	18	Gold Hill Dredging Co.	Dredge
6	Tuolumne gold dredge	La Grange	Stanislaus	7	Tuolumne Gold Dredging Corporation	Dredge
7	Eagle Shawmut	Mother Lode	Tuolumne	6	Eagle Shawmut Mine	Gold ore
8	Original Sixteen to One	Alleghany	Sierra	11	Original Sixteen to One Mine, Inc.	Gold ore
9	Capital dredge	Folsom	Sacramento	[1]	Capital Dredging Co.	Dredge
10	Penn	Camp Seco	Calaveras	16	Eagle Shawmut Mine	Zinc ore
11	La Grange dredge No. 4	La Grange	Stanislaus	[1]	La Grange Gold Dredging Co.	Dredge
12	Ancho and Erie groups	Washington	Nevada	[1]	Ancho-Erie Mining Co.	Gold ore
13	French Gulch Placer	French Gulch	Shasta	[1]	French Gulch Dredging Co.	Dredge
14	Kister	Oroville	Butte	[1]	Gold Hill Dredging Co.	Dredge
15	Butte Unit	Oroville	Butte	[1]	Yuba Consolidated Gold Fields	Dredge
16	Blue Moon	Hunter Valley	Mariposa	12	Red Cloud Mines, Inc.	Zinc ore
17	Merced Dredge No. 1	Snelling	Merced	[1]	Merced Dredging Co.	Dredge
18	Thurman dredge	Igo	Shasta	[1]	Thurman Gold Dredging Co.	Dredge
19	Brush Creek	Downieville	Sierra	86	Alfred L. Merritt	Gold ore
20	Mount Gaines	Hunter Valley	Mariposa	10	Mount Gaines Mining Co.	Gold ore
21	Junction City	Junction City	Trinity	[1]	Junction City Mining Co.	Dredge
22	Columbia No. 2	Resting Springs	Inyo	13	Shoshone Mines, Inc., and Finley Co.	Lead ore
23	Siskiyou Unit	Callahan	Siskiyou	[1]	Yuba Consolidated Gold Fields	Dredge
24	Yreka gold dredge	Klamath River	Siskiyou	[1]	Yreka Gold Dredging Co.	Dredge
25	Lancha Plana	Folsom	Sacramento	[1]	Lancha Plana Gold Dredging Co.	Dredge

[1] Not operated in 1944.

Total Gold Production of California

The presence of gold in stream gravels near Los Angeles was known, and gravel was worked in a small way by the Indians, at least as early as 1841,[1] and possibly 1820.[2] On March 2, 1844, Don Manuel Castanares, deputy for California to the Congress of Mexico, reported [3] to his government that placers near Los Angeles had produced up to December, 1843, a total of 2000 ounces of gold dust, most of which had been sent to the United States Mint at Philadelphia.

As the padres and the rancheros discouraged the quest of gold, this early small production caused no particular excitement. It was not until James W. Marshall's finding of gold nuggets in the tail-race of Sutter's saw mill on the American River, January 24, 1848, was heralded abroad that the great rush began, and California became a commonwealth of first rank almost over night. There are, however, no authentic data on gold production prior to 1848, other than occasional scattered references such as above quoted.

The following table was originally compiled by Chas. G. Yale, of the Division of Mineral Resources, U. S. Geological Survey, but for a number of years statistician of the California State Mining Bureau and the U. S. Mint at San Francisco. The authorities chosen for certain periods were: J. D. Whitney, State Geologist of California; John Arthur Phillips, author of "Mining and Metallurgy of Gold and Silver" (1867); U. S. Mining Commissioner R. W. Raymond; U. S. Mining Commissioner J. Ross Browne; Wm. P. Blake, Commissioner from California to the Paris Exposition, where he made a report on "Precious Metals" (1867); John J. Valentine, author for many years of the annual report on precious metals published by Wells, Fargo & Company's Express; and Louis A. Garnett, in the early days manager of the San Francisco refinery, where records of gold receipts and shipments were kept. Mr. Yale obtained other data from the reports of the director of the U. S. Mint and the director of the U. S. Geological Survey. The authorities referred to who were alive at the time of the original compilation of this table in 1894 were all consulted in person or by letter by Mr. Yale with reference to the correctness of their published data, and the final table quoted was then made up.

No premium was paid on gold during 1932, the price being $20.67 a fine ounce. On August 29, 1933, an executive order lifted the embargo on gold ores, concentrates, precipitates, and unretorted amalgam, and on October 25, 1933, another order followed instructing the Reconstruction Finance Corporation to buy newly-mined gold at a price fixed by the U. S. Treasurer which corresponded to the world price, all of which had an effect on the 1933 gold yield. On January 30, 1934, the Gold Reserve Act of 1934 was passed, followed by the President's proclamation of January 13, 1934, which fixed the weight of the gold dollar at 15 5/21 grains, nine-tenths fine. The value of gold thereby became $35 a fine ounce. The average weighted value of gold per fine ounce in 1934 was $34.95.

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[1] Hittell, T. H., History of California, Vol. II, p. 12, 1885.
[2] Bancroft, H. H., History of California, Vol. II, p. 417, 1886.
[3] Mercantile Trust Review of the Pacific, Vol. XIV, No. 2, p. 43, Feb. 15, 1925.

The figures for 1903-1923 (inclusive) are those prepared by the U. S. Geological Survey; and since by the U. S. Bureau of Mines:

Total Gold Production of California, 1848 to 1945

Year	Fine ounces	Value	Year	Fine ounces	Value
1848	11,866	$245,301	1898	769,476	$15,906,478
1849	491,072	10,151,360	1899	741,881	15,336,031
1850	1,996,586	41,273,106	1900	767,390	15,863,355
1851	3,673,512	75,938,232	1901	821,845	16,989,044
1852	3,932,631	81,294,700	1902	818,037	15,910,320
1853	3,270,803	67,613,487	1903	788,544	16,300,653
1854	3,358,867	69,433,931	1904	901,484	18,633,676
1855	2,684,106	55,485,395	1905	914,217	18,898,545
1856	2,782,018	57,509,411	1906	906,182	18,732,452
1857	2,110,513	43,628,172	1907	809,214	16,727,928
1858	2,253,846	46,591,140	1908	907,590	18,761,559
1859	2,217,829	45,846,599	1909	979,007	20,237,870
1860	2,133,104	44,095,163	1910	953,734	19,715,440
1861	2,026,187	41,884,995	1911	954,870	19,738,908
1862	1,879,595	38,854,668	1912	953,640	19,713,478
1863	1,136,897	23,501,736	1913	987,187	20,406,958
1864	1,164,455	24,071,423	1914	999,113	20,653,496
1865	867,405	17,930,858	1915	1,085,646	22,442,296
1866	828,367	17,123,867	1916	1,035,745	21,410,741
1867	883,591	18,265,452	1917	971,733	20,087,504
1868	849,265	17,555,867	1918	799,588	16,528,953
1869	881,830	18,229,044	1919	807,667	16,695,955
1870	844,537	17,458,133	1920	692,297	14,311,043
1871	845,493	17,477,885	1921	759,721	15,704,822
1872	748,951	15,482,194	1922	709,678	14,670,346
1873	726,554	15,019,210	1923	647,210	13,379,013
1874	835,186	17,264,836	1924	636,140	13,150,175
1875	816,377	16,876,009	1925	632,035	13,065,330
1876	735,169	15,610,723	1926	576,798	11,923,481
1877	798,249	16,501,268	1927	564,586	11,671,018
1878	911,343	18,839,141	1928	521,740	10,785,315
1879	949,439	19,626,654	1929	412,479	8,526,703
1880	968,986	20,030,761	1930	457,200	9,451,162
1881	929,920	19,223,155	1931	523,135	10,814,162
1882	829,458	17,146,416	1932	569,167	11,765,726
1883	1,176,329	24,316,873	1933	[a]613,579	15,683,075
1884	657,900	13,600,000	1934	[b]719,064	25,131,284
1885	612,478	12,661,044	1935	[c]890,430	31,165,050
1886	711,911	14,716,506	1936	1,077,442	37,710,470
1887	657,349	13,588,614	1937	1,174,578	41,110,230
1888	616,000	12,750,000	1938	1,311,129	45,889,515
1889	542,425	11,212,913	1939	1,435,264	50,234,240
1890	595,486	12,309,793	1940	1,455,671	50,948,485
1891	615,759	12,728,869	1941	1,408,793	49,307,755
1892	608,166	12,571,900	1942	847,997	29,679,895
1893	606,664	12,538,780	1943	148,328	5,191,480
1894	670,636	13,863,282	1944	117,373	4,108,055
1895	741,798	15,334,317	1945	147,938	5,177,830
1896	831,158	17,181,562			
1897	767,779	15,871,401	Totals	101,509,407	$2,254,573,446

[a] Value calculated at an average weighted price of $25.56 per fine ounce; previously $20.6718.
[b] Value calculated at an average weighted price of $34.95 per fine ounce.
[c] Value $35 per fine ounce, beginning 1935.

IRIDIUM (see under Platinum)

IRON ORE

Bibliography: State Mineralogist Reports II, IV, V, X, XII-XV (inc.), XVII, XVIII, XXI-XXVII (inc.), XXX, XXXI, XXXIII-XXXVI (inc.), XXXVIII-XL (inc.). Bulletins 38, 67, 91, 113, 129. Am. Inst. Min. Eng., Trans. LIII. Min. & Sci. Press, Vol. 115, pp. 112, 117-122; Vol. 123, pp. 94-96, 113-114.

The iron ore shipped from California properties during 1945 totaled 240,917 net tons, valued at $883,434 f.o.b. mine, and came from one property each in Riverside, San Bernardino, Santa Cruz, and Shasta counties. The above figures showed a decrease in amount and value as compared with the 1944 output of 905,981 net tons, worth $2,360,694.

The ore mined during the year was hematite from Riverside and San Bernardino counties, which went to the steel plant at Fontana and was also used in the manufacture of high-iron cement; and as foundry flux; magnetite from Shasta County and magnetite sands from Santa Cruz County, both used as an aggregate in heavy concrete for ballast.

Considerable deposits of iron ore are known in California, notably in Shasta, Madera, Placer, Plumas, Riverside, San Bernardino and Los Angeles counties, but production has so far been limited for lack of an economic supply of coking coal. Some pig iron was made in the earlier years, utilizing charcoal for fuel, both in blast furnaces and by electrical reduction; also ferrochrome, ferromanganese and ferrosilicon have been made in California.

Iron Ore Production in California, by Years

Total iron ore production of California, with annual amounts and values, is as follows:

Year	Tons	Value	Year	Tons	Value
1881*	9,273	$79,452	1921	1,970	$12,030
1882	2,073	17,766	1922	3,588	18,868
1883	11,191	106,540	1923	3,102	18,665
1884	4,352	40,983	1924		
1885			1925	[a] 785	4,710
1886	3,676	19,250	1926		
1887			1927	[a] 5,272	26,000
1893	250	2,000	1928		
1894	200	1,500	1930		
1895			1931	[a] 100	700
1907	400	400	1932		
1908			1934		
1909	108	174	1935	[a] 38,339	163,714
1910	579	900	1936	31,084	155,434
1911	558	558	1937	5,490	29,340
1912	2,508	2,508	1938	27,878	141,406
1913	2,343	4,485	1939	16,990	77,788
1914	1,436	5,128	1940		
1915	724	2,584	1941	[a] 54,707	194,362
1916	3,000	6,000	1942	99,092	371,562
1917	2,874	11,496	1943	907,458	2,341,827
1918	3,108	15,947	1944	905,981	2,360,694
1919	2,300	13,796	1945	240,917	883,434
1920	5,975	40,889			
			Totals	2,399,681	$7,172,890

* Productions for the years 1881-1886 (inc.) were reported as "tons of pig iron" (U.S.G.S., Min. Res. 1885), and for the table herewith are calculated to "tons of ore" on the basis of 47.6% Fe as shown by an average of analyses of the ores (State Mineralogist Report IV, p. 242). This early production of pig iron was from the blast furnaces then in operation at Hotaling in Placer County. Charcoal was used in lieu of coke. Though producing a superior grade of metal, they were obliged finally to close down, as they could not compete with the cheaper English and eastern United States iron brought in by sea to San Francisco.

[a] Annual details concealed under 'Unapportioned.'

LEAD

Bibliography: State Mineralogist Reports IV, VIII-XV (inc.), XVII-XXVIII (inc.), XXX, XXXI, XXXIII-XXXVI (inc.), XXXIX, XLI.

Lead produced in California during 1945 came from properties in twelve counties and amounted to a total of 14,504,767 pounds of recoverable metal worth $1,247,410, and this was the largest annual yield of this metal in the State with the exception of that of 1917. The 1944 output amounted to 11,408,381 pounds worth $912,670. The average price received for lead, including bonus, in 1945 was 8.6¢ per pound, compared with 8¢ per pound in 1944; 7.5¢ per pound in 1943; 6.7¢ per pound in 1942; 5.7¢ per pound in 1941; 5¢ per pound in 1940; and 4.7¢ per pound in 1939.

Distribution of the 1945 output of lead by counties was as follows:

County	Pounds	Value
Butte	45,321	$3,898
Calaveras	50,253	4,322
Inyo	13,214,935	1,136,484
Mariposa	236,315	20,323
Mono	14,712	1,265
San Bernardino	863,582	74,268
Shasta	57,599	4,954
Amador, El Dorado, Kern, Placer, Orange*	22,050	1,896
Totals	14,504,767	$1,247,410

* Combined to conceal the output of individual operators in each.

Lead Production of the United States

According to data issued by the U. S. Bureau of Mines[1] during 1945, the production of primary lead from domestic ores in the United States was 356,535 net tons valued at $45,636,500, being a decrease of approximately 6 percent from 1944 when 394,443 net tons worth $48,184,700 were produced. During 1945 there were 637,499 short tons of refined lead consumed in the United States, compared with 722,820 short tons in 1944.

[1] U. S. Bureau of Mines, Mineral Market Notes 1441, July 31, 1946.

Lead Production of California, by Years

Statistics on lead production in California were first compiled by this Bureau in 1887. Amount and value of the output, annually, with total figures, to date, are given in the following table:

Lead Production of California, by Years

Year	Pounds	Value	Year	Pounds	Value
1877	[a]7,836,000	$391,800	1912	1,370,067	$61,653
1878	8,640,000	328,320	1913	3,640,951	160,202
1879	4,502,000	191,335	1914	4,697,400	183,198
1880	4,200,000	215,460	1915	4,796,299	225,426
1881	6,680,000	325,316	1916	12,392,031	855,049
1882	[b]4,000,000	196,800	1917	21,651,352	1,862,016
1883	[c]3,400,000	145,520	1918	13,464,869	956,006
1884	3,200,000	120,512	1919	4,139,562	219,397
1885	2,000,000	80,900	1920	4,903,738	392,300
1886	2,000,000	93,400	1921	1,149,051	51,707
1887	[d]1,160,000	52,200	1922	6,511,280	358,120
1888	900,000	38,250	1923	9,934,522	695,416
1889	940,000	35,720	1924	4,984,387	398,751
1890	800,000	36,000	1925	7,352,422	639,661
1891	1,140,000	49,020	1926	8,067,873	645,429
1892	1,360,000	54,400	1927	2,748,440	173,151
1893	666,000	24,975	1928	1,882,795	109,102
1894	950,000	28,500	1929	1,428,777	90,014
1895	1,592,400	49,364	1930	3,542,796	176,241
1896	1,293,500	38,805	1931	3,934,240	245,568
1897	596,000	20,264	1932	2,418,626	72,480
1898	655,000	23,907	1933	772,463	28,583
1899	721,000	30,642	1934	804,911	29,655
1900	1,040,000	41,600	1935	1,142,405	45,695
1901	720,500	28,820	1936	1,098,545	50,533
1902	349,440	12,230	1937	2,402,110	141,724
1903	110,000	3,960	1938	1,003,096	46,142
1904	124,000	5,270	1939	1,061,294	49,880
1905	533,680	25,083	1940	3,092,636	154,632
1906	338,718	19,307	1941	6,900,851	393,348
1907	328,681	16,690	1942	10,329,176	692,054
1908	1,124,483	46,663	1943	11,811,034	885,827
1909	2,685,477	144,897	1944	11,408,381	912,670
1910	3,016,902	134,082	1945	14,504,767	1,247,410
1911	1,403,839	63,173			
			Totals	262,350,767	$16,362,225

[a] Quantities for 1877-1881 (inc.) from C. E. Siebenthal, Mineral Resources of U. S. 1912, Part I, U. S. Geol. Survey, p. 339; and values for same years from quotations in Eng. & Min. Jour., New York.
[b] Estimated.
[c] Quantities and values for 1883-1886 (inc.) from Mineral Resources of U. S. Geol. Surv., 1883-1886, respectively.
[d] Data from 1887 to date from reports of California State Mining Bureau.

MANGANESE

Bibliography: State Mineralogist Reports XII-XV (inc.), XVIII, XXII-XXVII (inc.), XXIX-XXXI, XXXIII-XLI (inc.). Bulletins 38, 67, 76, 91, 125. U. S. G. S. Bull. 427. Eng. & Min. Jour.-Press, Vol. 117, p. 545.

Shipments of manganese ore during 1945 came from 12 properties in ten counties and amounted to a total of 1,621 long tons of an average grade of 52.05% Mn, which, when recalculated to basis of 45% Mn, would equal 1,875 long tons valued at $86,270; compared with shipments from 67 properties in twenty counties in 1944, totaling 34,282 long tons of an average grade of 39.72% Mn, which, when recalculated to basis of 45% Mn, would equal 30,263 long tons, worth $1,097,655. Although some of the ore was mined prior to 1945, the shipments came from properties in Alameda, Humboldt, Imperial, Marin, Plumas, Riverside, San Joaquin, San Luis Obispo, Stanislaus, and Trinity counties; also a property in San Bernardino was mined but no shipments were made. The ore varied in grade from a high coming from the largest individual

shipper, which was in San Luis Obispo County, that averaged 55.16 Mn; to a low, a small shipment from Trinity County, which ran 35.67% Mn.

The average received by California miners for ore shipped in 1945 was $53.32 a long ton f.o.b. mine, compared with $32.02 a long ton f.o.b. mine in 1944; $30.46 a long ton f.o.b. mine in 1943; and $23.10 a long ton f.o.b. mine in 1942.

Manganese Ore Production in California, by Years

Production of manganese ore in California began at the Ladd Mine, San Joaquin County, in the Telsa District in 1867. When shipments of this ore to England ceased late in 1874, upwards of 5000 tons had been produced by that property. For some years following that, the output was small. The tabulation herewith shows California's output of manganese ore, annually, since 1887, when the compilation of such figures was begun by the State Mining Bureau:

Manganese Production in California by Years

Year	Tons	Value	Year	Tons	Value
1887	1,000	$9,000	1916	13,404	$274,601
1888	1,500	13,500	1917	15,515	396,659
1889	53	901	1918	26,075	979,235
1890	386	3,176	1919	11,569	451,422
1891	705	3,830	1920	2,892	62,323
1892	300	3,000	1921	1,005	12,210
1893	270	4,050	1922	540	7,650
1894	523	5,512	1923	690	10,620
1895	880	8,200	1924	1,115	25,785
1896	518	3,415	1925	832	19,450
1897	504	4,080	1926	235	4,700
1898	440	2,102	1927		
1899	295	3,165	1928		
1900	131	1,310	1929 *	733	8,216
1901	425	4,405	1930		
1902	870	7,140	1931 *	207	2,576
1903	1	25	1932		
1904	60	900	1934		
1905			1935 *	432	4,630
1906	1	30	1936		
1907	1	25	1939	6	45
1908	321	5,785	1940	314	3,206
1909	3	75	1941	3,565	75,057
1910	265	4,235	1942	17,362	505,190
1911	2	40	1943	25,729	957,317
1912	22	400	1944	30,263	1,098,555
1913			1945	2,100	86,270
1914	150	1,500			
1915	4,013	49,098	Totals	168,222	$5,124,616

* Annual details concealed under 'Unapportioned.'

MOLYBDENUM

Bibliography: State Mineralogist Reports XIV, XVII-XXIV (inc.), XXVI-XXVIII (inc.), XXX, XXXIV-XXXVI (inc.), XXXIX. Bulletins 67, 91, 130. U. S. Bur. of Min., Bulletin 111. Proc. Colo. Sci. Soc., Vol. XI.

During 1945 no shipments of molybdenum concentrates were made from California, as the mill of the United States Vanadium Corporation's Pine Creek property near Bishop, Inyo County, was down during the year, but they expect to resume operations about the middle of 1946. The 1943 output was the largest annual yield.

Molybdenum is used as an alloy constituent in the steel industry, and in certain forms of electrical apparatus. Included in the latter is its successful substitution for platinum and platinum-iridium in electric contact-making and -breaking devices. In alloys it is used similarly to

and in conjunction with chromium, cobalt, iron, manganese, nickel, tungsten and vanadium. The oxides and the ammonium salt have important chemical uses.

The growing consumption of molybdenum by alloy-steel makers in the United States has been stimulated by the fact that molybdenum alone of the steel-alloying metals can be produced commercially in the United States to an extent which avoids all necessity for importation. Another fact has been the marked adaptability of molybdenum steels to large-scale production of automobile and other parts.

The present (Sept. 12, 1946) quotations on molybdenum ores are 45¢ per pound of MoS_2 contained, f.o.b. mine, and on ferromolybdenum are 95¢ per pound Mo, 55%-65% Mo f.o.b. shipping point.

The two principal molybdenum minerals are: the sulphide, molybdenite, and wulfenite, lead molybdate; the former furnishing practically the entire commercial output. Molybdenite is found in or associated with acidic igneous rocks, such as granite and pegmatite.

Deposits of disseminated molybdenite are known in several localities in California, and in at least two places it occurs in small masses associated with copper sulphides. The first recorded commercial shipments of molybdenum ore in California were during the war, 1916-1918. Some development work has been done on a high-grade deposit at the head of the Kaweah River, Tulare County.

Molybdenum Production of California, by Years

California's production of molybdenum ore by years is summarized in the following tabulation:

Year	Pounds of MoS_2	Value
1916	9,280	$9,945
1917	7,290	9,014
1918		
1919	270	300
1933		
1934 [a]	1,306	306
1939		
1940 [a]	383,233	147,126
1941		
1942 [a]	3,775,566	1,228,203
1943		
1944	*	*
1945		
Totals	4,176,945	$1,394,894

[a] Annual details concealed under 'Unapportioned.'

NICKEL

Bibliography: State Mineralogist Reports XIV, XVII, XXIV, XXV, XXVIII, XXX, XXXIV-XXXVI (inc.) XXXIX. U. S. G. S., Bulletin 640-D. U. S. Bureau of Standards, Circular 100.

Nickel occurs in the Friday Copper Mine in the Julian District, San Diego County. The ore is a nickel-bearing pyrrhotite, with some associated chalcopyrite. Some ore has been mined in the course of development work but not treated nor disposed of, as they were unable to get any smelter to handle it for them. Nickel ore has also been reported from other localities in California, but not yet confirmed.

Present (Sept. 12, 1946) quotations for nickel are around 35¢ per pound for the refined metal.

OSMIUM (see under Platinum)

PALLADIUM (see under Platinum)

PLATINUM GROUP METALS

Bibliography: State Mineralogist Reports IV, VIII, IX, XII-XXVI (inc.), XXVIII, XXX, XXXI, XXXIV-XXXVII (inc.). Bulletins 38, 45, 67, 85, 91, 92. U. S. Geol. Surv., Bulletins 193, 285. Trans. Am. Inst. Min. Eng., Vol. 47, pp. 217-218.

In California the platinum-group metals are obtained as a by-product from placer operations for gold. The major portion of it comes from the dredges working in Amador, Butte, Merced, Sacramento, Stanislaus, Shasta, Trinity and Yuba counties, with a small amount coming from the hydraulic and surface sluicing mines of Del Norte, Humboldt, Siskiyou and Trinity counties.

During 1945 in California 145 fine ounces of platinum group metals were shipped, of which 62 fine ounces were platinum, 32 fine ounces were iridium, 29 fine ounces osmium, 10 fine ounces ruthenium, 11 fine ounces rhodium, and 1 fine ounce palladium.

In 1944 no platinum metals were reported shipped from California mines for the first time since 1887, the year that production data began in this State. This was due to the shut-down of the gold mines.

Present quotations[1] (Sept. 12, 1946) are, platinum $80 a fine ounce; iridium $125 per fine ounce; osmium per fine ounce, $100; palladium per fine ounce, $24; ruthenium per fine ounce, $70; rhodium per fine ounce, $125.

Platinum Production of California, by Years

The annual production and values since 1887 have been as follows:

Year	Ounces	Value	Year	Ounces	Value
1887	416	$10,400	1917	610	$43,719
1888	100	400	1918	571	42,788
1889	500	2,000	1919	*418	60,611
1890	500	2,000	1920	477	68,977
1891	600	2,500	1921	613	58,754
1892	100	500	1922	795	90,288
1893	80	440	1923	602	78,546
1894	75	517	1924	273	36,452
1895	100	600	1925	292	39,937
1896	150	900	1926	322	32,005
1897	162	944	1927	139	10,749
1898	150	900	1928	312	27,902
1899	300	1,800	1929	212	14,416
1900	300	1,800	1930	217	11,700
1901	400	2,500	1931	305	11,979
1902	250	3,200	1932	278	8,142
1903	39	468	1933	236	7,255
1904	70	1,052	1934	424	14,884
1905	123	1,849	1935	121	4,153
1906	200	3,320	1936	1,000	40,669
1907	91	1,647	1937	530	23,704
1908	300	6,255	1938	1,069	35,150
1909	706	13,414	1939	896	32,135
1910	337	8,386	1940	1,358	62,419
1911	511	14,873	1941	909	40,590
1912	603	19,731	1942	941	41,927
1913	368	17,738	1943	834	40,662
1914	463	14,816	1944		
1915	667	21,149	1945	145	6,719
1916	886	42,642			
			Totals	24,446	$1,185,973

* Fine ounces, beginning with 1919.

[1] E. & M. J., Metal and Mineral Markets, Sept. 12, 1946.

QUICKSILVER

Bibliography: State Mineralogist Reports IV, V, XII-XV, XVII-XXIX (inc.), XXXI, XXXIII-XXXVII (inc.), XXXIX-XLI (inc.). Bulletins 27, 78, 91. U. S. Geol Surv., Monograph XIII. U. S. Bur. of Mines, Tech. Papers 96, 227; Bulletin 222, 335.

Quicksilver produced in California during 1945 came from 43 properties in 12 counties and amounted to a total of 21,063 flasks (76 pounds), valued at $2,697,835 f.o.b. mine. This was a decrease in both amount and value as compared with the 1944 output which was 28,097 flasks, worth $3,178,969 f.o.b. mine, and came from 63 properties in 14 counties.

A breakdown of the 1945 production by counties was not given as it would essentially reveal the output of the principal producer in the individual county. The new Idria Mine in San Benito County continued to be the largest producer, followed in turn by the Mt. Jackson Mine in Sonoma County; the Reed Mine in Yolo County and the Abbot Mine in Lake County. Other counties having producing properties were Contra Costa, Del Norte, Fresno, Kings, Napa, San Luis Obispo, Santa Clara, and Trinity.

California as in the past led all other states in the United States with approximately 70 percent of the Nation's yield. Quotations at New York for quicksilver started the year 1945 with an average of $156.85 per flask (76 pounds) for January, going to a high of an average of $165.55 per flask for February; then dropping to a low of an average of $95.84 per flask for September and ending the year with an average of $108 per flask for December. The average of New York quotations for the year was $134.89 per 76-pound flask compared with $118.36 per flask in 1944; and $195.21 per flask in 1943. The California miner received an average of $128.08 per 76-pound flask for his quicksilver in 1945; compared with $113,14 per flask in 1944; and $181.96 per flask in 1943.

Total Quicksilver Production of California

Total amount and value of the quicksilver production of California, as given in available records, are shown in the following tabulation. Though the New Almaden Mine in Santa Clara County was first worked in 1824, and was in practically continuous operation from 1846 to 1921 (the yield being small the first two years), no data are available on the output earlier than 1850. Previous to June, 1904, a 'flask' of quicksilver contained 76½ pounds; then 75 pounds up to and including 1927; beginning with 1928, 76 pounds. In compiling this table the following sources of information were used: for 1850-1883, table by J. B. Randol, in Report of State Mineralogist IV, p. 336; 1883-1893, U. S. Geological Survey reports; 1894 to date, statistical bulletins of the State Mining Bureau; also State Mining Bureau, Bulletin 27, "Quicksilver Resources of California," 1908, p. 10.

Quicksilver Production of California, by Years

Year	Flasks	Value	Average price per flask	Year	Flasks	Value	Average price per flask
1850	7,723	$768,052	$99 45	1899	29,454	$1,405,045	$47 70
1851	27,779	1,859,248	66 93	1900	26,317	1,182,786	44 94
1852	20,000	1,166,600	58 33	1901	26,720	1,285,014	48 46
1853	22,284	1,235,648	55 45	1902	29,552	1,276,524	43 20
1854	30,004	1,663,722	55 45	1903	32,094	1,335,954	42 25
1855	33,000	1,767,150	53 55	1904	[a]28,876	1,086,323	37 62
1856	30,000	1,549,500	51 65	1905	24,655	886,081	35 94
1857	28,204	1,374,381	48 73	1906	19,516	712,334	36 50
1858	31,000	1,482,730	47 83	1907	17,379	663,178	38 16
1859	13,000	820,690	63 13	1908	18,039	763,520	42 33
1860	10,000	535,500	53 55	1909	16,217	773,788	47 71
1861	35,000	1,471,750	42 05	1910	17,665	799,002	45 23
1862	42,000	1,526,700	36 35	1911	19,109	879,205	46 01
1863	40,531	1,705,544	42 08	1912	20,600	866,024	42 04
1864	47,489	2,179,745	45 90	1913	15,661	630,042	40 23
1865	53,000	2,432,700	45 90	1914	11,373	557,846	49 05
1866	46,550	2,473,202	53 13	1915	14,199	1,157,449	81 52
1867	47,000	2,157,300	45 90	1916	21,427	2,003,425	93 50
1868	47,728	2,190,715	45 90	1917	24,382	2,396,466	98 29
1869	33,811	1,551,925	45 90	1918	22,621	2,579,472	114 03
1870	30,077	1,725,818	57 38	1919	15,200	1,353,381	89 04
1871	31,686	1,999,387	63 10	1920	10,278	775,527	75 45
1872	31,621	2,084,773	65 93	1921	3,157	140,666	44 56
1873	27,642	2,220,482	80 33	1922	3,466	191,851	55 35
1874	27,756	2,919,376	105 18	1923	5,458	332,851	60 98
1875	50,250	4,228,538	84 15	1924	7,948	543,080	68 33
1876	75,074	3,303,256	44 00	1925	7,683	621,831	80 81
1877	79,396	2,961,471	37 30	1926	5,892	516,382	87 64
1878	63,880	2,101,652	32 90	1927	6,488	714,418	111 67
1879	73,684	2,194,674	29 85	1928	[b]7,107	844,649	118 84
1880	59,926	1,857,706	31 00	1929	10,152	1,195,705	117 78
1881	60,851	1,815,185	29 83	1930	11,374	1,255,257	110 36
1882	52,732	1,488,624	28 23	1931	13,478	1,121,624	83 22
1883	46,725	1,343,344	28 75	1932	5,349	279,780	52 30
1884	31,913	973,347	30 50	1933	4,102	229,472	55 94
1885	32,073	986,245	30 75	1934	7,946	534,135	67 22
1886	29,981	1,064,326	35 50	1935	9,353	628,590	67 23
1887	33,760	1,430,749	42 38	1936	8,758	671,055	76 62
1888	33,250	1,413,125	42 50	1937	9,995	837,789	83 82
1889	26,464	1,190,880	45 00	1938	12,171	846,497	69 55
1890	22,926	1,203,615	52 50	1939	11,201	1,105,563	98 43
1891	22,904	1,036,406	45 25	1940	18,907	3,209,754	169 77
1892	27,993	1,139,595	40 71	1941	25,612	4,509,041	176 03
1893	30,164	1,108,527	36 75	1942	30,087	5,553,357	184 58
1894	30,416	934,000	30 70	1943	33,948	6,177,159	181 96
1895	36,104	1,337,131	37 04	1944	28,097	3,178,969	113 14
1896	30,765	1,075,449	34 96	1945	21,063	2,697,835	128 08
1897	26,691	993,445	37 28				
1898	31,092	1,188,626	38 23	Totals	2,574,025	$144,538,250	

[a] Flasks of 75 lbs. from June, 1904; of 76½ lbs. previously.
[b] Flasks of 76 lbs. from January, 1928.

SILVER

Bibliography: State Mineralogist Reports IV, VIII, XII-XXXIX (inc.), XLI. Bulletins 67, 91, 108. Min. & Sci. Press, March 1, 1919.

The output of silver in California during 1945 amounted to a total of 986,798 fine ounces valued at $701,723, being an increase in both amount and value as compared with the 1944 production which was 778,936 fine ounces worth $553,910. Of the 1945 yield 6,050 fine ounces worth $4,302 came from the placers, the remaining 980,748 fine ounces worth $697,421 came from lode or deep mines. The average price paid for newly mined silver in 1945 was 71.11¢ per fine ounce compared with 71.11¢ per fine ounce in 1944 to 1940; 67.80¢ per fine ounce in 1939; 64.60¢ per fine ounce in 1938; 77.35¢ per fine ounce in 1937; and 77.45¢ per fine ounce in 1936.

Silver production by counties for 1945 was as follows:

County	Fine ounces	Value
Amador	12,517	$8,901
Butte	19,107	13,587
Calaveras	65,265	46,411
El Dorado	1,112	791
Fresno	17	12
Humboldt	7	5
Inyo	637,881	453,604
Kern	543	386
Los Angeles	422	300
Madera	83	59
Mariposa	96,524	68,639
Merced	139	99
Modoc	7	5
Nevada	12,288	8,738
Orange	2,655	1,888
Placer	162	115
Plumas	8	6
Sacramento	1,509	1,073
San Bernardino	33,021	23,482
San Francisco		
San Joaquin	754	536
Santa Cruz	1	1
Shasta	94,462	67,173
Sierra	846	602
Siskiyou	2,530	1,799
Stanislaus	516	366
Trinity	180	128
Tuolumne	2,808	1,997
Yuba	1,434	1,020
Totals	986,798	$701,723

The following paragraph is quoted from the U. S. Bureau of Mines,[a] chapter on Gold and Silver from Mineral Year Book 1944, by courtesy of Alfred L. Ransome:

"*Silver.*—Most of the silver output in California in 1945 was more localized than that of the gold; the 10 leading silver-producing mines listed in the following table yielded 95 percent of the State total recoverable silver in that year, and the 3 leading mines yielded 72 percent. Of the 10 leading silver-producing mines, 9 derived their silver from argentiferous base-metal ores and 1 from gold ore.

"Silver production by months in 1945, shows an uninterrupted but gradual decline during the first 6 months, a spurt upward in July followed by a drop to the low point of 49,695 fine ounces in August, and a subsequent rapid rise during the remaining 4 months. The entire background for the trends in production is closely allied to the operation of the Darwin group of mines, Coso district, Inyo County. Purchased by the Anaconda Copper Mining Co. August 1, the Darwin property was energetically developed; although production during August was low, the rapid increase in output is reflected in the unchecked rise in total production for the State during the last 4 months of 1945."

[a] U. S. Bureau of Mines, Mineral Year Book, 1945. (Chapter reprint), Gold, Silver, Copper, Lead, and Zinc in California, pp. 7-8.

Ten Leading Silver-producing Mines in California in 1945, in Order of Output

Rank	Mine	District	County	Rank 1944	Operator	Source of Silver
1	Darwin group	Coso	Inyo	1	Darwin Mines (Arthur J. Theis, trustee) and Anaconda Mining Co.	Zinc-lead ore
2	Blue Moon	Hunter Valley	Mariposa	2	Red Cloud Mines Inc.	Zinc ore
3	Hornet	Flat Creek	Shasta	4	The Mountain Copper Co., Ltd.	Zinc
4	Penn	Campo Seco	Calaveras	7	Eagle Shawmut Mine	Zinc ore
5	Columbia No. 2	Resting Springs	Inyo	3	Shoshone Mines, Inc., Finley Co.	Lead ore
6	Modoc	Coso	Inyo	[1]	L. D. Forcman & Co.	Lead ore
7	Mohawk	Clark Mountain	San Bernardino	17	Dunton-Ray & Greenwood	Zinc-lead ore
8	Big Bend	Yankee Hill	Butte	14	Hoefling Bros.	Zinc ore
9	Newton	Ione	Amador	27	Winston Copper Co.	Copper ore
10	Idaho Maryland and Brunswick	Grass Valley-Nevada City	Nevada	29	Idaho Maryland Mines Corporation	Gold ore

[1] Not operated in 1944.

Silver Production of California, by Years

The amount and value of the silver production of California, and the average price, annually, since 1880 are given in the table following. In the table shown in the statistical bulletins previously to Bulletin 97 (for 1925), the values shown for 1880-1904 (inc.) were taken from the reports of the Director of the Mint, of which the figures for 1880-1896 (inc.) were based on 'coinage value' ($1.2929 per fine ounce). We have recalculated these to commercial value, using the price table of the U. S. Geological Survey (McCaskey, H. D.), Gold and Silver, 1913: Mineral Resources of the U. S., Part I, p. 847. From 1905 to date, the figures are those of the U. S. Geological Survey and its successor, the U. S. Bureau of Mines. Figures for the years prior to 1880 are not available, as there were no reliable records compiled.

Silver Production of California, by Years, Since 1880

Year	Fine oz.	Value	Average price per oz.	Year	Fine oz.	Value	Average price per oz.
1880	882,169	$1,014,494	$1 15	1914	1,471,859	$813,938	0 553
1881	580,091	655,503	1 13	1915	1,678,756	851,129	507
1882	653,569	745,069	1 14	1916	2,564,354	1,687,345	658
1883	1,129,244	1,253,461	1 11	1917	1,775,431	1,462,955	824
1884	3,236,987	3,593,056	1 11	1918	1,427,711	1,427,711	1 00
1885	1,968,260	2,125,298	1 07	1919	1,107,189	1,240,051	1 12
1886	1,245,747	1,233,290	99	1920	1,706,327	1,859,896	1 09
1887	1,262,282	1,237,036	98	1921	3,629,223	3,629,223	1 00
1888	1,314,874	1,235,982	94	1922	3,100,065	3,109,065	1 00
1889	823,947	774,510	94	1923	3,559,443	2,918,743	82
1890	820,336	861,353	1 05	1924	3,555,133	2,381,952	67
1891	737,224	729,852	99	1925	3,054,416	2,119,765	694
1892	358,575	311,960	87	1926	2,022,460	1,262,015	624
1893	415,468	324,065	78	1927	1,620,242	918,677	567
1894	229,896	144,834	63	1928	1,478,711	865,081	585
1895	463,911	301,542	65	1929	1,176,895	627,285	533
1896	326,757	222,195	68	1930	1,622,803	624,779	385
1897	754,648	452,789	60	1931	867,818	251,667	290
1898	701,788	414,055	59	1932	493,533	139,176	282
1899	855,869	513,521	60	1933	402,591	140,907	350
1900	1,168,157	724,257	62	1934	844,413	545,883	[a]644
1901	950,831	570,499	60	1935	1,191,112	856,112	[a]719
1902	1,163,041	616,412	53	1936	2,103,799	1,629,392	[a]775
1903	958,230	517,444	54	1937	2,888,265	2,234,073	[a]774
1904	1,441,259	835,929	58	1938	2,590,804	1,674,863	[a]646
1905	1,076,174	650,009	61	1939	2,599,139	1,764,264	[a]678
1906	1,220,641	817,830	68	1940	2,359,776	1,678,063	[a]711
1907	1,138,856	751,646	66	1941	2,154,188	1,531,867	[a]711
1908	1,647,278	873,057	53	1942	1,450,440	1,031,424	[a]711
1909	2,098,253	1,091,092	52	1943	609,075	433,120	[a]711
1910	1,840,085	993,646	54	1944	778,936	553,910	[a]711
1911	1,270,445	673,336	53	1945	986,798	701,723	[a]711
1912	1,300,136	799,584	6 15				
1913	1,378,399	832,553	6 04	Totals	96,285,132	$71,857,213	

[a] Average price applied to newly mined within the United States.

TIN

Bibliography: Reports XV, XVII, XVIII, XXV, XXXI, XXXIV, XXXV-XXXVII, XLI. Bulletins 67, 91.

During 1945 no tin ore was reported shipped from California. In 1944 a small shipment of tin ore was reported from Kern County which was shipped to the stock-pile of the Metal Reserve Company. The annual details were concealed under the 'Unapportioned' item so as not to reveal the output of an individual producer.

In 1940 some development work was done at the Apex Mine nine miles north of Cima, San Bernardino County, but no shipment reported to date. Here the tin ore occurs in small kidneys along the talcose slip in dolmitic limestone.

In 1928 and 1929 a small amount of tin was produced from California ore and considerable development work was done at the Temescal mine in Riverside County near Corona. An output from the district during 1891-1892 is tabulated below. Small quantities of stream tin have been found in some of the placer workings in northern California, but never in paying amounts.

Two occurrences have also been noted, in northern San Diego County. Crystals of cassiterite were found there, associated with blue tourmaline crystals, amblygonite and beryl. No commercial quantity has been developed, only small pockets having been taken out.

Total Output of Tin in California

Year	Pounds	Value
1891	125,289	$27,564
1892	126,000	32,400
1928} 1929} *	1,200	580
1944	a	a
1945		
Totals	252,489	$60,544

* Annual details concealed under 'Unapportioned.'

TITANIUM

Bibliography: State Mineralogist's Reports XXIII, XXXIV.

During 1945 no titanium minerals were reported shipped in California; although during the year a mill was built in Sand Canyon, near Saugus, Los Angeles County, to concentrate ilmenite to be used on roofing paper. This property is now in operation.

During 1944 small shipments of titanium ore (ilmenite) were made from material recovered from beach sand at Hermosa Beach, Los Angeles County. The annual details are concealed under the 'Unapportioned' item to conceal the output of an individual producer.

All titanium ore mined in this State came from Los Angeles County and was produced from either the beach black sands which contained approximately 20% titaniferous iron and magnetite, the gangue being silica and several silicates; or from a lode deposit in the San Gabriel Mountains.

The market price of titanium minerals varies with the titanium oxide they contain. Present (Sept. 12, 1946) quotations are: Rutile 94% TiO at 8¢ to 10¢ a pound, ilmenite 59 to 60% TiO at $24 to $26 a gross ton, all prices Atlantic seaboard.

The metal is used in several different alloys with iron, copper and aluminum and for green and white paint pigments, the only colors of titanium pigments now in common use. It is also used in dyes, rubber, as a porcelain glaze, in glass, and cement made from high-titanium iron slags. This cement is resistant to the action of acids.

Total Output of Titanium in California by Years

Year	Tons	Value
1927} 1928} *	10,013	$150,195
1929		
1939} 1940} *	160	1,800
1941} 1942} *	295	3,685
1943} 1944} *	250	3,400
1945		
Totals	10,718	$159,080

* Annual details concealed under 'Unapportioned.'

TUNGSTEN

Bibliography: Reports XV, XVII, XVIII, XXII, XXIV, XXVIII (inc.), XXX, XXXIV-XXXIX (inc.), XLI. Bulletins 38, 67, 91, 95, U.S.G.S., Bull. 652. Proc. Colo. Sci. Soc., Vol. XI. South Dakota School of Mines, Bulletin No. 12. Eng. and Min. Jour.-Press, Vol. 113, pp. 666-669, Apr. 22, 1922.

During 1945 shipments were made in California of high-grade tungsten ore and concentrates as reported to the Division of Mines by producers, amounting to a total of 71,511 units of WO_3 or an equivalent of 1,192 net tons of 60% WO_3 concentrates, valued at $1,587,951, which came from properties in Fresno, Inyo, Kern, Mono, San Bernardino, and Tulare counties. In addition to the shipments, some ore was mined in Alpine County, but none was milled or shipped. The 1945 output showed a decrease in both amount and value as compared with that of 1944, which totaled 203,965 units of WO_3, or an equivalent of 3,399 tons of 60% WO_3 concentrates valued at $4,835,810.

The average amount received by California miners in 1945 was $22.21 per unit WO_3, compared with $23.71 per unit WO_3 in 1944; $23.26 per unit WO_3 in 1943; $24.16 per unit WO_3 in 1942; $23.77 per unit of WO_3 in 1941; and $21.15 per unit of WO_3 in 1940.

Tungsten ores have been produced in California principally in the Atolia-Randsburg district in San Bernardino and Kern counties, and the Bishop district in Inyo County; with smaller amounts having come from near Posey (Jack Ranch), Tulare County; Benton, Mono County; the Kings River district in Fresno County; in eastern San Bernardino County near Goffs and Ivanpah; the Grass Valley district in Nevada County; and recently added to the above is the Darwin district in Inyo County; the Kernville and Weldon districts in Kern County; Topaz Lake district in Mono County; and near Warm Springs, San Diego County. Also there are known occurrences of tungsten ores in Alpine, Calaveras, El Dorado, Mariposa, Madera, Plumas, Riverside, Shasta, and Tuolumne counties, of which several are now in production. It also should be considered that in the last ten years there have been more new tungsten deposits discovered than any other type of mineral deposit in this State. Nearly all the ore mined in California has been scheelite (calcium tungstate), although wolframite (iron-manganese tungstate), hübnerite (manganese tungstate), and other tungsten minerals are found in small amounts, in part associated with the scheelite.

Total Tungsten Ore Production of California

The annual amount and value of tungsten ores and concentrates produced in California since the inception of the industry is given herewith, with tonnages recalculated to 60% WO_3:

Tungsten Production of California by Years

Year	Tons at 60% WO_3	Value	Average unit WO_3 value	Year	Tons at 60% WO_3	Value	Average unit WO_3 value
1905	57	$18,800	$5 50	1927} [a]			
1906	485	189,100	6 50	1928}	649	$429,237	$11 03
1907	287	120,587	7 00	1929	150	106,280	11 81
1908	105	37,750	5 99	1930} [a]			
1909	577	190,500	6 50	1931}	120	82,582	11 47
1910	457	208,245	7 60	1932	26	9,509	6 10
1911	387	127,706	5 50	1933	148	76,605	8 63
1912	572	206,000	6 00	1934	261	224,417	14 33
1913	559	234,673	7 00	1935	218	194,542	14 87
1914	420	180,575	7 17	1936	236	210,819	14 89
1915	962	1,005,467	17 42	1937	611	782,187	21 34
1916	2,270	4,571,521	33 57	1938	732	786,860	17 92
1917	2,466	3,079,013	20 81	1939	1,235	1,153,735	15 47
1918	1,982	2,832,222	24 82	1940	1,784	2,267,135	21 15
1919	214	219,316	17 08	1941	2,860	4,080,628	23 77
1920				1942	3,853	5,586,770	24 16
1923	34	19,126	8 17	1943	4,235	5,910,745	23 26
1924	781	446,009	9 52	1944	3,399	4,835,810	23 71
1925	573	348,475	10 14	1945	1,192	1,587,951	22.21
1926	441	316,560	11 96	Totals	35,338	$42,677,457	

[a] Annual details concealed under 'Unapportioned.'

ZINC

Bibliography: State Mineralogist Reports XIV, XV, XVII, XVIII, XX-XXIV, XXVI, XXVII, XXX, XXXIII-XXXV (inc.), XXXIX, XLI. Bulletins 38, 67, 91.

The recoverable zinc metal produced in California during 1945 amounted to a total of 19,340,732 pounds valued at $2,224,184 and came from properties in nine counties, compared with 16,456,103 pounds worth $1,875,996 in 1944 which came from properties in eight counties. The value of the 1945 output was the largest of any year, and the amount was exceeded only by that of 1926.

The distribution of the 1945 zinc output by counties is as follows:

	Lbs.	Value
Butte	2,586,024	$297,393
Calaveras	4,633,253	532,824
Inyo	1,297,975	149,267
Kern	11,897	1,368
Mariposa	6,621,322	761,452
Mono	6,445	741
Orange	25,683	2,953
San Bernardino	131,588	15,133
Shasta	4,026,545	463,053
Totals	19,340,732	$2,224,184

Primary zinc produced in the United States [1] during 1945 amounted to 764,561 net tons valued at $139,974,000 of which 467,084 tons came from domestic ores and 297,477 tons came from foreign ores; compared with 869,302 net tons worth $157,954,000 in 1944 of which 574,453 tons were domestic ores and 294,849 tons foreign ores. Consumption of slab zinc in the United States in all industries during 1945 totaled 852,311 net tons, compared with 888,626 tons in 1944.

The zinc ores in Shasta and Calaveras counties are associated with those of copper, while those of Inyo, Los Angeles, Orange, San Bernardino, and Tulare are associated principally with lead-silver and zinc-silver ores.

Total Zinc Production of California

Total figures for zinc output of the State are as follows, commercial production dating back only to 1906:

Year	Pounds	Value	Year	Pounds	Value
1906	206,000	$12,566	1926	20,447,559	$1,533,568
1907	177,759	10,598	1927	8,625,004	552,000
1908	54,000	3,544	1928	----------	----------
1909	----------	----------	1929	----------	----------
1910	----------	----------	1931	149,865	5,314
1911	2,679,842	152,751	1932	----------	----------
1912	4,331,391	298,866	1933	290,222	12,189
1913	1,157,947	64,845	1934	721,719	31,034
1914	399,641	20,381	1935	328,013	14,432
1915	13,043,411	1,617,383	1936	29,740	1,487
1916	15,950,565	2,137,375	1937	39,643	2,577
1917	11,854,804	1,209,190	1938	17,554	843
1918	5,565,516	506,466	1939	16,390	852
1919	1,384,192	101,046	1940	182,088	11,472
1920	1,188,009	96,229	1941	880,612	66,046
1921	846,184	42,309	1942	1,275,906	118,659
1922	3,034,430	172,963	1943	5,170,627	558,427
1923	----------	----------	1944	16,456,103	1,875,996
1924	3,060,000	198,900	1945	19,340,732	2,224,184
1925	11,546,602	877,542	Totals	150,452,070	$14,532,034

VANADIUM

Bibliography: Reports XV, XXVI. Bulletins 67, 91. Proc. Colo. Sci. Soc., Vol. XI, XXXVI. U. S. Bur. of Mines, Bulletin 104.

No commercial production of vanadium has yet been made in California. Occurrences of this metal have been found at Camp Signal, near Goffs, in San Bernardino County, and two companies at one time did considerable development work in the endeavor to open up paying quantities. Some ore carrying lead vanadate has been developed in the 29 Palms, or Washington district, on the line between Riverside and San Bernardino counties, but no shipments reported.

The principal use of vanadium is as an alloy in steels, especially in tool steel, and in those varieties where resistance to repeated strains is required. Present (Sept. 12, 1946) New York quotations for ferro-vanadium are $2.75-$2.90 per pound of vanadium f.o.b. works, and vanadium ore 27½¢ per pound V_2O_5 contained f.o.b. shipping point.

[1] U. S. Bureau of Mines, Mineral Market Report 1442, August 1, 1946.

CHAPTER FOUR

INDUSTRIAL NON-METALIC MATERIALS

Bibliography: State Mineralogist Reports XII-XLI (Inc.). Bulletin 38. Min. & Sci. Press, Vol. 114, March 10, 1917. Spurr and Wormser, "Marketing of Metals and Minerals." "Non-Metallic Minerals," by R. B. Ladoo. "Industrial Minerals and Rocks," A. I. M. E., 1937. See also under each substance.

The following mineral substances have been arbitrarily arranged under the general heading of 'Industrial Non-Metallic Materials' as distinguished from those which clearly have a defined classification, such as fuels, metals, and salines.

These materials, many of which are mineral earths, are in many cases as yet produced on comparatively a small scale. The possibility of development of several of these are large; and with increased accessibility and other facilities, together with the steadily growing demand being brought about by the expansion of and establishing of new chemical and manufacturing plants in the West, the future of this branch of the mineral industry in California is very bright. There is not a county in the State that cannot contribute to this group's output. In 1944 and 1945 all counties contributed but one, namely, Kings.

Prior to 1945 this group was broken down into Structural Materials and Industrial Materials. This was a good grouping of materials when first made and for many years after; but, for several years past, changing requirements and new uses have made it almost impossible to distinguish between industrial and structural materials.

This group as a whole showed a decrease in total value from $62,292,547 in 1944 to $59,695,692 in 1945.

The following table gives the comparative figures for amount and value of industrial non-metalic materials produced in California during the years 1944 to 1945:

Industrial Nonmetalic Substances

Substance	1944		1945		Increase+ Decrease— Value
	Amount	Value	Amount	Value	
Bentonite	25,851 tons	$180,065	*	*	* +
Brick and hollow tile		3,930,662		$3,523,661	$407,001—
Cement	14,599,752 bbls.	21,249,520	15,922,772 bbls.	23,469,027	2,219,507+
Clay (pottery)	491,363 tons	1,241,652	497,586 tons	1,345,966	104,314+
Dolomite	217,018 tons	619,425	*	*	* —
Granite		222,943		220,411	2,532—
Gypsum	558,488 tons	949,833	442,133 tons	954,696	4,863+
Limestone	734,425 tons	1,714,414	532,480 tons	1,626,844	87,570—
Mineral water	24,445,814 gals.	812,645	26,502,875 gals.	798,430	14,215—
Pumice and volcanic ash	34,525 tons	272,064	89,209 tons	461,022	188,958+
Sandstone		*		7,498	* +
Silica (quartz and glass sand)	274,291 tons	830,311	581,725 tons	1,309,564	479,253+
Soapstone and talc	64,041 tons	824,052	65,202 tons	922,682	98,630+
Stone, miscellaneous	35,370,143 tons	25,138,003	29,449,484 tons	20,207,351	4,930,652—
Unapportioned		[a]4,306,958		[b]4,848,540	541,582+
Total values		$62,292,547		$59,695,692	
Net decrease					$2,596,855

* Included under 'Unapportioned.'

[a] Includes asbestos, barite, bituminous rock, carbon dioxide, diatomite, feldspar, fluorspar, gem material, lithia, magnesite, marble, mica, mineral paint, pyrite, sandstone, sillimanite group, slate, strontium minerals, and tube mill pebbles.

[b] Includes asbestos, barite, bentonite, bituminous rock, carbon dioxide, diatomite, dolomite, feldspar, gem materials, garnets (abrasive), lithia, magnesite, mica, mineral paint, pyrite, sillimanite group, slate, strontium minerals, and tube mill pebbles.

ASBESTOS

Bibliography: State Mineralogist Reports XII-XIX (inc.), XXII, XXVII(inc.), XXIX, XXXI-XXXII, XXXIV-XXXVII (inc.), XXXIX-XLI (inc.). Bulletins 38, 91. Canadian Dept. of M., Mines Branch Bulletin 69. Min. and Sci. Press, April 10, 1920, pp. 531-533. Eng. & Min. Jour.-Press, Vol. 113, pp. 617-625, 670-677. Asbestology, Vol. 5, No. 7, July 1927.

During 1945 production of asbestos in California came from a single property each in Napa and Shasta counties. The annual details are concealed under the 'Unapportioned' item so as not to reveal the output of either producer. The 1945 output was a decrease in amount and value as compared with that of 1944. The total of the 1943-44 output was 723 net tons valued at $15,000.

Of the 1944 and 1945 production, that coming from Napa County was the chrysotile variety and that from Placer and Shasta counties was tremolite asbestos.

There are two principal varieties of asbestos, amphibole and serpentine. The most valuable and widely used is the serpentine or chrysotile variety. Chrysotile asbestos has short strong fibers varying in length from $\frac{1}{8}$ of an inch to three inches but mostly less than one inch. The value of the material varies greatly as to the length of the fiber; the longer demanding a premium. It is used as insulation for heat and electricity, in brake linings, steam packing, pipe coverings, in paint, waterproof paper roofing, cement, stucco, and plasters, in heat resisting textiles, as gloves, curtains, cord, etc.

The amphibole variety may be any one of several minerals of the amphibole group. The fibers of this type are weak and often brittle, and they are much more abundant but their uses are limited and value small, being restricted to heat insulation, chemical filters, and sometimes as a filler.

Asbestos Production of California, by Years

Total amount and value of asbestos production in California since 1887, as given in the records of this Bureau, are as follows:

Year	Tons	Value	Year	Tons	Value
1887	30	$1,800	1915	143	$2,860
1888	30	1,800	1916	145	2,380
1889	30	1,800	1917	136	10,225
1890	71	4,260	1918	229	9,903
1891	66	3,960	1919*	131	6,240
1892	30	1,830	1920		
1893	50	2,500	1921	410	19,275
1894	50	2,250	1922	50	1,800
1895	25	1,000	1923	20	200
1896			1924	70	4,750
1897			1925*	25	1,650
1898	10	200	1926		
1899	30	750	1927*	13	1,160
1900	50	1,250	1928		
1901	110	4,400	1929*	219	6,175
1902			1930		
1903			1931		
1904	10	162	1932*	309	3,274
1905	112	2,625	1934		
1906	70	3,500	1935		
1907	70	3,500	1936		
1908	70	6,100	1941	16	2,867
1909	65	6,500	1942	4	836
1910	200	20,000	1943*	723	15,000
1911	125	500	1944		
1912	90	2,700	1945	*	*
1913	47	1,175			
1914	51	1,530	Totals	4,135	$164,687

* Annual details concealed under 'Unapportioned.'

ASPHALT

Bibliography: State Mineralogist Reports VII, X, XII-XV (inc.), XVII, XVIII, XXXVIII. Bulletins 16, 32, 63, 67, 69, 91, 118.

Asphalt was for a number of years accounted for in the statistical reports by the State Mining Bureau, because in the early days of the oil industry, considerable asphalt was produced from outcroppings of oil sand, and was a separate industry from the production of oil itself. However, at the present time most of the asphalt comes from the oil refineries, which produce a better and more uniform grade; hence, its value is not now included in the mineral total, as to do so would be in part a duplication of the crude petroleum figures. Such natural asphalt as is at present time mined is in the form of bituminous sandstones, and is recorded under that designation.

BARITE

Bibliography: State Mineralogist Reports XXII, XIV, XV, XVII, XXI-XXVIII (inc.), XXXIV, XXXV, XXXVII, XXXIX. Bulletins 38, 87. Eng. & Min. Jour.-Press, Vol. 114, p. 109, July 15, 1922; Vol. 115, pp. 319-324, Feb. 17, 1923. U. S. Bureau of Mines, inform. Circ. 6221, 6223.

During 1945 barite produced in California came from three properties, one each in Mariposa, Nevada, and Plumas counties. The annual details are concealed under the 'Unapportioned' item so as not to reveal the output of an individual. This material was consumed in the manufacture of lithopone, heavy-gravity oil-well drilling-mud fillers and barium chemicals.

The 1945 output was the largest annual yield of barite so far reported in this State. The 1944-45 shipments totaled 67,783 net tons worth $409,825.

Barite's largest use in the United States is in the manufacture of lithopone, which is a chemically-prepared white pigment containing approximately 70% barium sulphate and 30% zinc sulphide. This is one of the principal constituents of 'flat' wall paints. Other important uses for barite, after washing and grinding, are as an inert pigment and filler in paint, paper, linoleums, oilcloth and rubber manufacture, and in the preparation of a number of chemicals including barium binoxide, carbonate, chloride, nitrate, the sulphate precipitated, or 'blanc fixe,' and in medicine.

Present (Sept. 12, 1946) quotations for barite (95% $BaSO_4$) vary from $8.50 to $9.00 per ton, crude, f.o.b. rail shipping point. Most barite has to be washed and acid treated to remove iron stains or other impurities before being suitable for paint use.

Known occurrences of this mineral in California are located in Inyo, Los Angeles, Mariposa, Monterey, Nevada, Plumas, San Bernardino, Shasta, Santa Barbara and Tulare counties. The deposit at El Portal, in Mariposa County, has given the largest commercial production to date, in part witherite (barium carbonate, $BaCO_3$). The carbonate is especially desirable, as it is a simpler and hence a cheaper source for preparation of barium chemicals, notably the nitrate which is used in priming mixture for incendiary bombs.

Total Barite Production of California

The first recorded production of barite in California, according to the statistical reports of the State Mining Bureau, was in 1910. The annual figures are as follows:

Year	Tons	Value	Year	Tons	Value
1910	860	$5,640	1929	26,796	$168,829
1911	309	2,207	1930	19,783	133,107
1912	564	2,812	1931	27,832	156,647
1913	1,600	3,680	1932	8,507	49,409
1914	2,000	3,000	1933	8,405	49,595
1915	410	620	1934	21,769	125,514
1916	1,606	5,516	1935	22,979	133,810
1917	4,420	25,633	1936*	41,882	245,392
1918	100	1,500	1937		
1919	1,501	18,065	1938*	66,228	396,218
1920	3,029	20,795	1939		
1921	901	4,809	1940*	57,728	377,229
1922	3,370	18,925	1941		
1923	2,925	16,058	1942*	53,625	311,910
1924			1943		
1925			1944	67,783	409,825
1926	4,798	38,165	1945		
1927	17,993	90,617			
1928	13,406	55,888	Totals	483,109	$2,871,415

* Annual details concealed under 'Unapportioned.'

BENTONITE (Fuller's Earth)

Bibliography: State Mineralogist Reports XIV, XVII, XVIII, XXI, XXIII, XXV-XXI (inc.), XXXIV, XXXVI-XXXVII (inc.), Bulletins 83,91. U. S. Bureau of Mines, Bulletin 71, Technical Paper 609. Eng. & Min. Jour.-Press, Vol. 121, pp. 837-842, May 22, 1926.

Bentonite was produced and shipped during 1945 in California from two properties in San Bernardino County, and a single property in Inyo County. The annual details are concealed under the 'Unapportioned' item so as not to reveal the output of an individual. The 1945 output showed a decrease in amount and an increased value compared with that of 1944, which was 25,581 net tons valued at $180,065 and came from three properties in Inyo County; two in San Bernardino; and one in Kern County.

Previous to 1931 the Division of Mines classed this material under the heading of 'fuller's earth,' but it was thought advisable to change the name to bentonite, owing to the fact that much bentonite is employed in uses that can not be classed as fuller's earth and therefore had been classified in these reports under pottery clay. This was somewhat confusing. Bentonite is the name commonly applied to the clays of the montmorillonite and halloysite group ('rock soap').

Fuller's earth includes many kinds of unctuous clays. It is usually soft, friable, earthly, nonplastic, white and gray to dark green in color, and some varieties disintegrate in water. Production has come mainly from Calaveras and Solano counties, with other deposits noted also in Riverside, Fresno, Inyo and Kern counties.

Bentonite Production of California, by Years

Bentonite including a small amount of fuller's earth was first produced commercially in this State in 1899, and the total amount and value of the output since that time are as follows:

Year	Tons	Value	Year	Tons	Value
1899	620	$12,400	1923	3,650	$55,125
1900	500	3,750	1924	5,290	67,295
1901	1,000	19,500	1925	5,280	91,842
1902	987	19,246	1926	23,552	250,192
1903	250	4,750	1927	13,018	154,764
1904	500	9,500	1928	53,232	501,743
1905	1,344	38,000	1929	15,541	170,563
1906	440	10,500	1930	12,522	177,964
1907	100	1,000	1931	13,960	222,583
1908	50	1,000	1932	4,295	57,670
1909	459	7,385	1933	4,605	60,621
1910	340	3,820	1934	6,168	69,325
1911	466	5,294	1935	10,204	68,372
1912	876	6,500	1936	10,185	165,131
1913	460	3,700	1937	8,425	140,261
1914	760	5,928	1938	9,374	113,164
1915	692	4,002	1939	11,284	138,864
1916	110	550	1940	10,360	174,002
1917	220	2,180	1941	18,369	164,582
1918	37	333	1942	7,453	67,503
1919	385	3,810	1943	11,480	118,257
1920	600	6,000	1944	25,581	180,065
1921	1,185	8,295	1945	*	*
1922	6,606	48,756			
			Totals	302,815	$3,436,087

* Annual details concealed under 'Unapportioned' item.

BITUMINOUS ROCK

Bibliography: State Mineralogist Reports XII, XIII, XV, XVII, XVIII, XXI, XXII, XXV, XXVI, XXXI, XXXIX, XL.

This material is essentially an uncemented sandstone which is saturated with and held together by a natural asphaltic constituent, probably the residue from the evaporation of a crude petroleum deposit. Bituminous rock is still used to a limited extent for road dressing in those districts adjacent to available deposits, though the manufacture of asphalt at the oil refineries has almost entirely superseded the direct use of the native material. Some of the Santa Cruz County production is put on the market as a material which can be laid cold. This material is especially applicable and valuable for patch jobs.

During 1945 the shipments of bituminous rock in California came from a single property in Santa Cruz County; the annual details are concealed under the 'Unapportioned' item so as not to reveal the output of a single operator. The 1945 shipments showed a decrease in amount and value as compared with those of 1944.

Bituminous Rock Production of California, by Years

The following tabulation shows the total amount and value of bituminous rock quarried and sold in California, from the records compiled by the State Mining Bureau, annually since 1887:

Year	Tons	Value	Year	Tons	Value
1887	36,000	$160,000	1917	5,590	$18,580
1888	50,000	257,000	1918	2,561	9,067
1889	40,000	170,000	1919	4,614	18,537
1890	40,000	170,000	1920	5,450	27,825
1891	39,962	154,164	1921	8,298	43,192
1892	24,000	72,000	1922	4,624	13,570
1893	32,000	192,036	1923	2,945	11,780
1894	31,214	115,193	1924	6,040	14,922
1895	38,921	121,586	1925	2,681	10,724
1896	49,456	122,500	1926	3,863	21,577
1897	45,470	128,173	1927	3,515	17,704
1898	46,836	137,575	1928	4,966	38,832
1899	40,321	116,097	1929	3,320	14,360
1900	25,306	71,495	1930	8,525	36,075
1901	24,052	66,354	1931 *	23,653	109,140
1902	33,490	43,411	1932 *		
1903	21,944	53,106	1933 *	36,793	130,301
1904	45,280	175,680	1934 *		
1905	24,753	60,436	1935 *	41,681	133,344
1906	16,077	45,204	1936 *		
1907	24,122	72,835	1937 *	36,128	139,242
1908	30,718	109,818	1938 *		
1909	34,123	116,436	1939	16,546	63,612
1910	87,547	165,711	1940 *	29,709	86,903
1911	75,125	117,279	1941 *		
1912	44,073	87,467	1942 *	39,798	156,193
1913	37,541	78,479	1943 *		
1914	66,119	166,618	1944	*	*
1915	17,789	61,468	1945	*	*
1916	19,449	66,561			
			Totals	1,432,988	$4,590,162

* Annual details concealed under 'Unapportioned.'

BRICK AND HOLLOW TILE

Bibliography: State Mineralogist Reports VIII, X, XII-XV (inc.), XVII-XXVIII (inc.), XXXII, XXXVII. Bulletins 38, 39. Preliminary Report No. 7. Cal. Jour. of Development, June, 1925, pp. 5-6.

Bricks of many varieties and in important quantities are annually produced in California, as might be expected in a State with such diversified and widespread mineral resources. The varieties include common, fire, pressed, glazed, enamel, fancy, vitrified, sand-lime, and others. Not only do the plants here supply practically all of our own requirements in these products, but considerable quantities are shipped to contiguous territory and certain products are shipped over a much wider radius. We also include under this heading the various forms of hollow building 'tile' or blocks.

Brick and hollow building tile manufactured in California during 1945 in 27 plants which reported production in 13 counties, of which there was a total of 52,955 M of common brick, valued at $793,393; 29,514 M of fire brick 9-inch equivalent, valued at $2,276,683; 5,801 M of glazed, pressed, vitrified, and fancy brick valued at $190,679; and 16,439 tons of hollow building tile, valued at $258,906; the entire output having a total of $3,523,661. The 1945 production showed a decrease in amount and value of brick and building tile as compared with that

of 1944, which was 65,546 M of common brick, worth $981,833; 37,754 M of fire brick, worth $2,477,746; 7,276 M of glazed, pressed, fancy, and vitrified brick worth $287,949; and 18,702 tons of hollow building tile, worth $183,134; with a total value of $3,930,662.

The 1945 output came from 10 plants in Los Angeles County, 3 in Contra Costa County; 2 each in Alameda, Sacramento, and Son Joaquin Counties; and 1 each in Amador, Fresno, Placer, San Bernardino, San Diego, Santa Barbara, Riverside, and Santa Clara counties.

Brick and Hollow Tile Production of California, by Years

Record of brick production in the State has been kept since 1893 by this Bureau, the figures for hollow building 'tile' or blocks being also included since 1914. The annual and total figures, for amount and value, are given in the following table:

Hollow Building tile at Plant of Kraftile, Niles, Alameda County—*Photo by Walter W. Bradley*

Year	Brick, M	Hollow building blocks, tons	Value
1893	103,900		$801,750
1894	81,675		457,125
1895	131,772		672,360
1896	24,000		524,740
1897	97,468		563,240
1898	100,102		571,362
1899	125,950		754,730
1900	137,191		905,210
1901	130,766		860,488
1902	169,851		1,306,215
1903	214,403		1,999,546
1904	281,750		1,994,740
1905	286,618		2,273,786
1906	277,762		2,538,848
1907	362,167		3,438,951
1908	332,872		2,506,495
1909	333,846		3,059,929
1910	340,883		2,934,731
1911	327,474		2,638,121
1912	337,233		2,940,290
1913	358,754		2,915,350
1914	270,791		2,288,227
1915	180,538		1,678,756
1916	206,960		2,096,570
1917	192,269	29,348	2,532,721
1918	136,374	34,818	2,363,481
1919	156,328	36,026	3,087,067
1920	245,842	99,208	5,704,393
1921	238,022	67,100	5,570,875
1922	374,853	105,909	7,994,991
1923	397,754	122,534	9,738,082
1924	456,716	114,469	9,137,908
1925	361,094	105,491	7,503,976
1926	388,048	90,332	7,026,124
1927	374,111	75,116	6,516,077
1928	272,443	66,277	5,694,770
1929	327,011	66,713	5,607,410
1930	267,019	68,047	4,205,460
1931	151,545	51,988	2,560,415
1932	90,683	27,098	1,605,086
1933	76,905	25,814	1,520,481
1934	66,738	17,534	1,644,661
1935	76,521	21,309	1,855,343
1936	131,667	16,081	2,240,905
1937	148,833	17,521	3,083,902
1938	129,273	16,592	2,594,546
1939	150,503	16,283	3,063,660
1940	129,887	29,048	2,762,885
1941	137,925	16,513	3,598,797
1942	180,935	24,703	5,708,967
1943	113,935	16,947	4,368,675
1944	110,576	18,702	3,930,662
1945	88,270	16,439	3,523,661
Totals	11,184,806	1,413,960	$169,467,541

CALCIUM SILICATE

Bibliography: State Mineralogist Report XXXIV, Mining and Metallurgy: Oct., 1935.

During 1945 no output of calcium silicate was reported in California. In 1941 one property in Kern County made some shipments to their mineral wool plant.

The annual details are concealed in the 'Unapportioned' item so as not to reveal its output.

The first commercial production of wollastonite was made in 1933 from a deposit operated by John T. Thorndyke in the Radamacher District in Kern County, and was shipped from Code's Siding to Los Angeles, where it was used to manufacture mineral wool. This was done by a new process in an electric furnace where the material is melted without the use of a flux and then blown to a fine fiber or wool by compressed air from jets. Mineral wool is an excellent insulating material for sound, heat and cold, and the manufacturer expects to use large quantities in proposed steel houses. This material, also, can be used in the manufacture of unbreakable glass.

Pyroxene is a silicate of calcium and magnesium and is found in crystalline limestone near the contact with intrusive igneous rocks and in basic igneous rocks such as gabbros. It is white to various shades of green, brown to black, having a hardness of 5 to 6 and a specific gravity 3.2 to 3.6.

Wollastonite is a calcium metasilicate ($CaSiO_3$) and usually found in crystalline limestone at the contact with intrusive igneous rocks. It is a white to gray mineral, having a hardness of $4\frac{1}{2}$ to 5 and a specific gravity of about 2.9.

Calcium silicate from 1934 to 1936 was classed in these California mineral production reports as wollastonite.

CARBON DIOXIDE GAS

Bibliography: State Mineralogist Reports XXII, XXXVIII, XL (inc.).

Carbon dioxide produced during 1945 in California came from wells operated by a single company near Niland, Imperial County, and a company near Hopland, Mendocino County. In addition the Anthony-Rivers Development Corporation brought in some carbon dioxide wells and expect to be in production in 1946. The annual details are concealed under the 'Unapportioned' item so as not to reveal the output of an individual company. The 1945 production showed a decline in both amount and value as compared with that of 1944. The 1944-1945 output totaled 429,382 M cubic feet of carbon dioxide gas which was compressed to 26,494 tons of dry ice valued at $524,280.

Carbon dioxide gas is found many places in nature and is produced commercially from wells and springs whose waters are highly charged with the gas. It is used as a gas in the manufacture of carbonate beverages and dry ice, and in the chemical reduction of carbonates; as dry ice, liquefied as a refrigerant, as a source of power, and in the chemical

industry. It has been stated that the amount of butyl rubber is limited only by the amount of dry ice available.

Carbon dioxide gas was first produced commercially in California in 1894. This material came from a drift on the 575 level of the Santa Isabel shaft of the New Almaden Quicksilver mine at Almaden, Santa Clara County. The drift was bulkheaded and a pipe was placed through the bulkhead for the gas to be drawn off. It was compressed into cylinders and used in the manufacture of soda water.

In 1933 carbon dioxide gas was again produced, this time from wells drilled near Niland, Imperial County. On November 1, 1934, a dry-ice plant was put into operation for condensation of the carbon dioxide produced from the above wells.

Carbon Dioxide Gas Production in California, by Years

Year	M cubic feet	Value
1894	80	$4,072
1895	800	12,000
1896	81	1,300
1897		
1933		
1934 *	15,440	1,822
1935		
1936		
1937 *	89,777	64,787
1938		
1939 *	131,189	13,799
1940	97,660	23,877
1941	138,862	258,563
1942	193,143	310,000
1943	227,424	248,126
1944	429,382	524,280
1945 *		
Totals	1,323,838	$1,462,626

* Annual details concealed under 'Unapportioned.'

CEMENT

Bibliography: State Mineralogist Reports VIII, IX, XII, XIV, XV, XVII, XVIII, XXI-XXVIII, inc.), XXXII, XXXIX, XLI. Bulletin 38.

During 1945 the production of cement in California totaled 15,922,772 barrels, valued at $23,469,027 f.o.b. plant, of which 7,481,404 barrels, worth $9,686,081, came from five northern California mills, and 8,441,368 barrels, worth $13,782,946, came from six southern California mills. The 1945 output was an increase in both amount and value over that of 1944, which amounted to 14,599,752 barrels valued at $21,249,520.

Shipments of cement during 1945 were made from eleven mills in nine counties to the extent of 15,864,134 barrels, valued at $23,469,662 f.o.b. plant, as compared with 14,947,713 barrels, worth $22,482,794 in 1944. During the year five mills operated in northern California; one each in Calaveras, Contra Costa, San Mateo, Santa Clara, and Santa Cruz counties, which shipped a total of 7,446,421 barrels, valued at $9,659,943; and six mills in southern California; three in San Bernardino County and one each in Kern, Los Angeles,[1] and Riverside counties, which shipped a total of 8,417,713 barrels, valued at $13,809,719.

[1] The plant in Los Angeles County grinds clinker coming from other counties, therefore the crude material is credited to the point of origin.

A mill in San Bernardino County which has been idle for several years resumed production during 1944. The mill in Merced County was sold and the company has been liquidated.

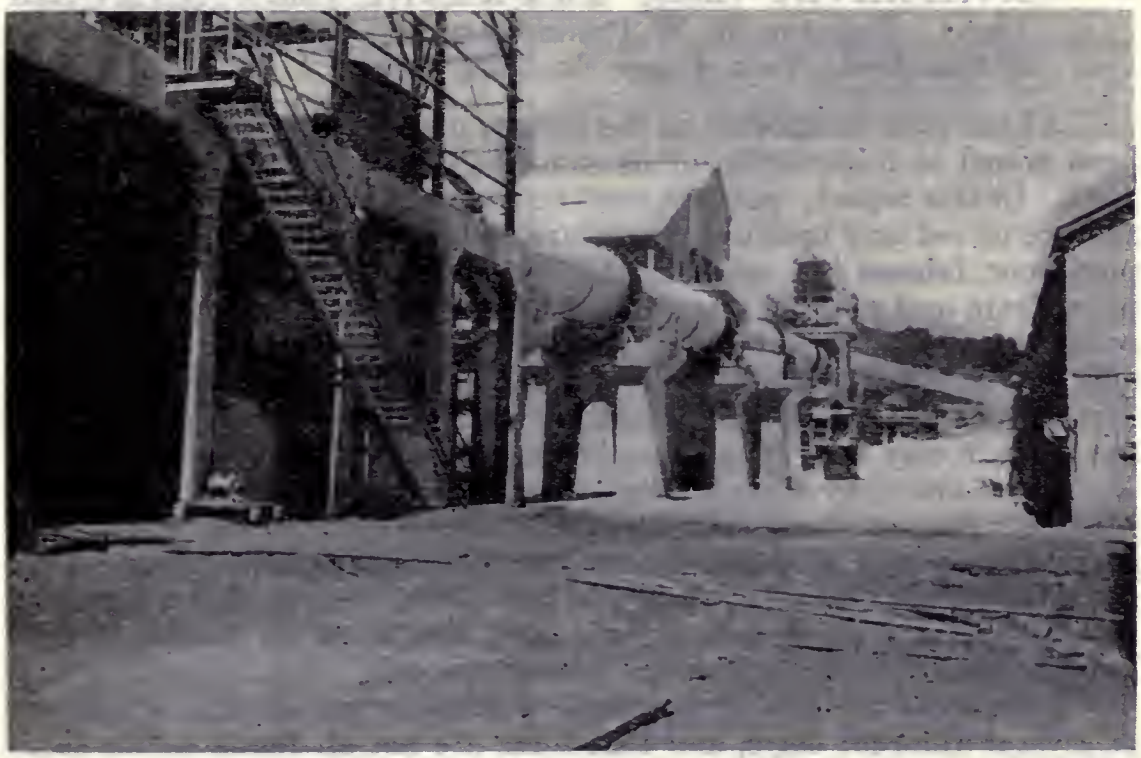
The annual capacity of the California cement mills according to the U. S. Bureau of Mines [2] was 27,740,000 barrels as of January 1, 1946, as compared with 27,390,000 barrels for January 1, 1945. During the year an average of 2,303 men were employed in the above mills.

Cement Production of California, by Years

'Portland' cement was first commercially produced in California in 1891; though in 1860 and for several years following, a natural hydraulic cement from Benicia was utilized in building operations in San Francisco.

"The Benicia Cement Company in 1859-60 was turning out 50 to 100 barrels of cement a day and San Francisco was using about 12,000 barrels a year. The mill price of the product was then $4 a barrel. By 1865, the San Francisco rate of consumption had increased to 100,000 barrels yearly, brick buildings largely taking the place of frame structures, and the price of cement had fallen to $2.50 a barrel, about the same as it is today."[3]

The growth of the industry became rapid after 1902; since which time cement has continued to be an important factor in the industrial life of the State. Although the total cement figures, to date, are not of the same magnitude as those for gold and petroleum, it is interesting to note that the value of California's cement yield in the period 1920-1931 and 1942-1945 annually exceeded the value of her gold output.



Photograph new kiln of Calaveras Cement Co. near San Andreas, Calaveras County—*Photo by Walter W. Bradley*

Cement Production of California, by Years

Year	Barrels	Value	Year	Barrels	Value
1891	5,000	$15,000	1919	4,645,289	$8,591,990
1892	5,000	15,000	1920	6,709,160	14,962,945
1893			1921	7,404,221	18,072,120
1894	8,000	21,600	1922	8,962,135	16,524,056
1895	16,383	32,556	1923	10,825,405	25,999,203
1896	9,500	28,250	1924	11,655,131	23,225,850
1897	18,000	66,000	1925	13,206,630	25,043,335
1898	50,000	150,000	1926	13,797,173	25,269,678
1899	60,000	180,000	1927	14,661,783	26,474,935
1900	52,000	121,000	1928	13,625,231	24,463,287
1901	71,800	159,842	1929	12,794,729	21,038,565
1902	171,000	423,600	1930	9,831,938	14,575,731
1903	640,868	968,727	1931	7,693,712	11,510,655
1904	969,538	1,539,807	1932	5,657,549	7,967,107
1905	1,265,553	1,791,916	1933	7,284,031	10,331,395
1906	1,286,000	1,941,250	1934	8,936,085	12,445,616
1907	1,613,563	2,585,577	1935	8,086,292	10,210,721
1908	1,629,615	2,359,692	1936	13,300,188	18,314,589
1909	3,779,205	4,969,437	1937	12,072,062	16,546,229
1910	5,453,193	7,485,715	1938	10,561,037	15,502,574
1911	6,371,369	9,085,625	1939	10,984,033	15,616,219
1912	6,198,634	6,074,661	1940	13,955,255	17,673,202
1913	6,167,806	7,743,024	1941	19,531,608	26,248,694
1914	5,109,218	6,558,148	1942	23,306,578	35,808,841
1915	4,918,275	6,044,950	1943	18,515,085	27,865,466
1916	5,299,507	6,210,293	1944	14,599,752	21,249,520
1917	5,790,734	7,544,282	1945	15,922,772	23,469,027
1918	4,772,921	7,969,909			
			Totals	380,257,546	$597,087,401

CLAY (Pottery)

Bibliography: State Mineralogist Reports I, IV, IX, XII-XV, XVIII-XXVIII (inc.), XXX-XXXIII (inc.), XXXV-XLI (inc.). Bulletins 38, 99. Preliminary Report No. 7, U. S. Bureau of Standards, Tech. Paper No. 262.

At one time or another in the history of the State, pottery clay has been mined in thirty-seven of its counties. Of these, 18 contributed in 1945. In this report, 'pottery clay' refers to all clays used in the manufacture of red and brown earthenware, china and sanitary ware, flower pots, floor, faience and ornamental tiling, architectural terra cotta, sewer pipe, drain and roof tile, etc., and the figures for amount and value are relative to the crude material at the pit without reference to whether the clay was sold in the crude form or was immediately used in the manufacture of any of the above finished products by the producer. It does not include clay used in making brick and hollow building blocks.

There are many other important uses for clay besides pottery manufacture. Among these may be enumerated paper, cotton goods, and chemicals. Clays of the montmorillonite and halloysite group ('rock soap') are being utilized successfully in the manufacture of soaps and for filtering oils and as oil-well drilling mud, also as an earth filler in irrigating ditches which run through porous ground.

Because of the fact that a given product often requires a mixture of several different clays, and that these are not all found in the same pit, it is necessary for most clay-working plants to buy some part of their raw materials from other localities. For these reasons, in compiling the clay industry figures much care is required to avoid duplications. So

far as we have been able to segregate the figures, from the data sent in by the operatives, we have credited the clay output to the counties from which the raw material originated; and have deducted tonnages used in brick manufacture, as bricks are classified separately, herein.

During 1945 forty properties operated in 18 counties in California, and reported an output of 497,586 net tons of pottery clay, valued at $1,345,966, f.o.b. shipping point for crude material; as compared with 35 properties in 18 counties producing 491,363 tons, worth $1,241,652 in 1944.

A tabulation of the direct returns from the producers, by counties, for the year 1945 is shown herewith:

Pottery Clay in 1945

County	Tons	Value	Used in the manufacture of
Alameda	8,269	$7,519	Roofing, floor, and mantel tile; chimney, drain, and sewer pipe. Prepared clay, fire clay and sand, and various.
Kern	168,925	[b]711,676	Oil-well drilling mud.
Los Angeles	54,307	60,518	Red earthenware, chimney, drain and sewer pipe; vents; floor, mantel, and roofing tile, art pottery; oil-well drilling mud, and various.
Orange	37,856	[a]117,871	Architectural terra cotta; conduits and segment blocks; electrical, porcelain, and chinaware; refractories; vents; drain, floor, and mantel tile; art pottery; and various.
Riverside	75,823	178,286	Conduit sewer, and drain pipe, red earthenware; faience, floor, mantel, roofing tile; refractory, and various.
San Bernardino	4,637	58,136	Roofing, floor and mantel tile; drain and sewer pipe; red earthenware; refractories; fire sand and various.
Amador[a], Calaveras, Marin, Placer, Sacramento, San Joaquin, Santa Barbara, Santa Clara, Stanislaus, Sutter, Ventura[b]*	147,769	211,960	Architectural terra cotta, drain, roofing, and mantel tile; saggers; electrical porcelain; refractories; red earthenware; garden furniture; oil-well drilling mud; sewer, drain, and conduit pipe; prepared clay, light weight aggregate; and various.
Totals	497,586	$1,345,966	

[a] Includes fire sand.
[b] Includes oil-well drilling mud.
* Combined to conceal the output of operators in each.

The above figures do not include clay reported as used in the manufacture of brick and hollow building tile or the bentonite clays, as these are included under separate headings.

POTTERY CLAY PRODUCTS

The output of ceramic products manufactured in California during 1945 had a total value of $10,650,381, as compared with $11,744,124 in

1944. The distribution by products for 1945 is shown in the following tabulation:

Product	Number of producers	Tons	Value
Architectural terra cotta, chimney pipe, and flue lining	8		$347,300
Drain pipe	10	9,514	147,415
Sewer pipe (glazed)	8	76,621	2,468,461
Floor, faience, mantel, and handmade tile	14		1,022,312
Roofing tile	10	11,433	270,401
Red earthenware	4		127,989
Stoneware and chemical stoneware	3		500,042
Chinaware and semi-vitreous tableware	5		4,149,850
Conduit	3	5,113	136,407
Fire clay and high-temperature cement	7	6,178	196,217
Miscellaneous: Electric-stone blocks, vents, art pottery, garden furniture, sanitaryware and plumbing fixtures, electrical porcelain, glass tank backs, grog, dolls, fire tile, clay shapes, light-weight aggregate, segment blocks, glazed flower pots, glazed kitchen ware, sundries, specialties, and various	10		1,283,987
Total value			$10,650,381

Of the ceramic products, increases in total value were registered in 1945 by architectural terra cotta, chimney pipe, and flue lining; drain pipe; roofing tile; red earthenware; stoneware and chemical stoneware; chinaware and semi-vitreous tableware; and conduit; all others showed a decrease in total value.

Pottery Clay Production of California, by Years

Amount and value of crude pottery clay output in California since 1887 are given in the following table:

Year	Tons	Value	Year	Tons	Value
1887	75,000	$37,500	1917	166,298	$154,602
1888	75,000	37,500	1918	112,423	166,788
1889	75,000	37,500	1919	135,708	245,019
1890	100,000	50,000	1920	203,997	440,689
1891	100,000	50,000	1921	225,120	362,172
1892	100,000	50,000	1922	277,232	473,184
1893	24,856	67,284	1923	376,863	697,841
1894	28,475	35,073	1924	417,928	651,857
1895	37,660	39,685	1925	537,587	674,376
1896	41,907	62,900	1926	801,461	806,509
1897	24,592	30,290	1927	867,419	872,661
1898	28,947	33,747	1928	887,807	1,394,950
1899	40,600	42,700	1929	839,949	1,127,527
1900	59,636	60,956	1930	938,586	795,517
1901	55,679	39,144	1931	332,680	408,931
1902	67,933	74,163	1932	167,284	204,890
1903	90,972	99,907	1933	141,629	211,711
1904	84,149	81,952	1934	190,510	245,900
1905	133,805	130,146	1935	240,014	377,969
1906	167,267	162,283	1936	382,823	646,920
1907	160,385	254,454	1937	354,669	705,200
1908	208,042	325,147	1938	304,564	582,608
1909	299,424	465,647	1939	305,517	611,599
1910	249,028	324,099	1940	324,399	687,871
1911	224,576	252,759	1941	551,347	1,217,363
1912	199,605	215,683	1942	622,958	1,200,293
1913	231,179	261,273	1943	622,019	1,185,240
1914	179,948	167,552	1944	491,363	1,241,652
1915	157,866	133,724	1945	497,586	1,345,966
1916	134,636	146,538			
			Totals	15,773,807	$23,507,414

DIATOMITE (Diatomaceous Earth)

Bibliography: State Mineralogist Reports II, XII-XV (inc.), XVII-XXVIII (inc.), XXXI-XXXIII, XXXV-XXXVI. Bulletins 38, 67, 91, 124. Am. Inst. Min. Eng., Bull. 104, Aug. 1915, pp. 1539-1550. U. S. Bur. of Mines, Rep. of Investigations: Serial No. 2341, Jan. 1923. Eng. & Min. Jour.-Press, Vol. 115, pp. 1152-1154, June 30, 1923.

Diatomite, also known as diatomaceous earth, infusorial earth, tripolite and kieselguhr, is very light (when dry a cubic foot weighs 18 to 20 pounds) and extremely porous, chalk-like material composed of pure silica (chalk is calcareous) which has been laid down under water and consists of the remains of microscopical infusoria and diatoms. The former are animal remains, and the latter are from plants.

The most important deposits in California thus far known are located in Los Angeles, Monterey, Orange, San Luis Obispo, and Santa Barbara counties. The diatomaceous earth of marine origin has proved of superior quality for filtration uses, which bring the higher prices. Infusorial or diatomaceous earths are also found in Contra Costa, Fresno, Kern, Modoc, Plumas, San Benito, San Bernardino, San Joaquin, Shasta, Siskiyou, Sonoma, and Tehama counties.

As about 75 percent of the California output is from a single operator, we have concealed the exact figures under the 'Unapportioned' Item in the State and county totals. There were four producing properties during 1945, two were in Santa Barbara County, and one each in Los Angeles and Siskiyou counties. The shipments during the year showed a decrease in amount, with a slight increase in value as compared with 1944.

The material shipped was utilized for insulation of both heat and sound, filtration, paint, pigment, cement admixture, filters, abrasives and for clarification of gasoline and kerosene.

Total Production of Diatomite in California

The first recorded production of these materials in California occurred in 1889; total amount and value of output to date, are as follows:

Year	Tons	Value	Year	Tons	Value
1889	39	$1,335	1918	35,963	$189,459
1890			1919	40,200	217,800
1891			1920	60,764	1,056,260
1892			1921		
1893	50	2,000	1922 *	90,739	1,016,675
1894	51	2,040	1923		
1895			1924 *	193,064	5,729,736
1896			1925		
1897	5	200	1926		
1898			1927 *	275,403	1,995,923
1899			1928		
1900			1929		
1901			1930 *	300,017	4,848,661
1902	422	2,532	1931		
1903	2,703	16,015	1932		
1904	6,950	112,282	1933 *	203,228	3,104,154
1905	3,000	15,000	1934		
1906	2,430	14,400	1935		
1907	2,531	28,948	1936 *	290,908	4,243,572
1908	2,950	32,012	1937		
1909	500	3,500	1938		
1910	1,843	17,617	1939 *	266,358	3,941,941
1911	2,194	19,670	1940		
1912	4,129	17,074	1941		
1913	8,645	35,968	1942 *	425,745	6,692,051
1914	12,840	80,350	1943	*	*
1915	12,400	62,000	1944	*	*
1916	15,332	80,649	1945		
1917	24,301	127,510	Totals	2,285,704	$33,707,334

* Annual details concealed under 'Unapportioned.'

DOLOMITE

Bibliography: State Mineralogist Reports XV, XVII, XXVII, XXVIII, XXXI, XXXIII-XXXIV, XXXVII, XXXIX.

The output of dolomite in California during 1945 came from a single property each in Monterey, San Benito, and Tuolumne counties, the annual details are concealed under the 'Unapportioned' item so as not to reveal the output of an individual. The value of the 1944 production was the largest so far reported in the State and totaled 217,018 net tons worth $619,425.

Most of the dolomite produced during the year was burnt to lime, this being used in the production of magnesia from sea water to be used in the reduction to magnesium metal and in magnesium refractories. Some of the raw dolomite was also used for steel-furnace flux and refractories, stucco dash, terrazzo and roofing granules, kalsomine, poultry grit, artstone, in the manufacture of mineral wool, and carbon dioxide.

Dolomite Production of California, by Years

Previous to the 1915 statistical report of the State Mining Bureau, dolomite was included under limestone, as the two minerals are closely related chemically; but since dolomite, as such, has been found to have certain distinctive applications, we here give it a separate classification.

Amount and value of the output of dolomite, annually, have been as follows:

Year	Tons	Value	Year	Tons	Value
1915	4,192	$14,504	1932	35,275	$40,956
1916	13,313	46,566	1933	54,456	176,575
1917	27,911	66,416	1934		
1918	24,560	79,441	1935	108,645	304,984
1919	24,502	67,953	1936	25,807	63,102
1920	42,383	132,791	1937	12,371	24,632
1921	31,195	99,155	1938	4,363	18,339
1922	52,409	114,911	1939	17,791	40,391
1923	69,519	142,615	1940	18,178	52,167
1924	28,843	71,271	1941	22,300	64,595
1925	42,852	104,900	1942	142,552	413,469
1926	68,640	119,313	1943	331,251	472,756
1927	45,976	79,422	1944	217,018	619,425
1928	38,379	85,342	1945	*	*
1929	58,644	156,928			
1930			Totals	1,629,894	$3,834,164
1931	66,564	161,245			

* Annual details concealed under 'Unapportioned.'

FELDSPAR

Bibliography: State Mineralogist Reports XV, XVII-XXVIII (inc.), XXX, XXXI, XXXIV-XLI (inc.). Bulletins 67, 91. U. S. Bureau of Mines, Bulletin 92. Eng. & Min. Jour.-Press, Vol. 115, pp. 535-538, Mar. 24, 1923.

During 1945 feldspar was produced and shipped in California from a single property in San Bernardino County.

During 1944 feldspar was produced and shipped from two properties in California, one each in Fresno and San Bernardino counties, the annual details being concealed under the 'Unapportioned' item to conceal the output of a property. The production showed a decrease in amount and value from the previous year.

The 1943-1944 total output of feldspar was 4,090 net tons valued at $11,152. Also produced is a large tonnage of glass feldspar which is contained in sands coming from Contra Costa, Monterey, and Riverside counties and is reported under glass sand and computed under silica, as the largest percentage of these sands is quartz.

The requirements of the pottery trade demand that in general the percentage of free silica associated with the feldspar be less than 20 percent, and in some cases the potters specify less than 5 percent. An important factor, also, is the iron-bearing minerals frequently present in pegmatites and granites, such as biotite (black mica), garnet, hornblende and black tourmaline. Feldspar for pottery uses should be practically free of these. The white, potash-mica, muscovite, is not particularly objectionable except that being in thin, flexible plates, it does not readily grind to a fineness required for the feldspar. Feldspar is also used in the manufacture of glass, enamel and sanitary ware, in soaps and abrasives, and as a binder for abrasive wheels, etc., all of which have similar specifications to that for pottery.

Total Feldspar Production in California

Total amount and value of feldspar production in California since the inception of the industry are given in the following table, by years:

Year	Tons	Value	Year	Tons	Value
1910	760	$5,720	1929	13,327	$78,404
1911	740	4,560	1930	5,014	35,654
1912	1,382	6,180	1931	4,795	59,921
1913	2,129	7,850	1932	2,294	15,988
1914	3,530	16,565	1933	*	
1915	1,800	9,000	1934	2,655	30,611
1916	2,630	14,350	1935	3,265	21,855
1917	11,792	46,411	1936	3,430	24,959
1918	4,132	22,061	1937	2,686	10,930
1919	1,272	12,965	1938	1,378	6,970
1920	4,518	26,189	1939	2,076	12,510
1921	4,349	28,343	1940	3,022	16,644
1922	4,587	37,109	1941	*	
1923	11,100	81,800	1942	10,040	56,718
1924	9,055	68,112	1943	*	
1925	8,165	59,615	1944	4,090	11,152
1926	7,300	56,400	1945	*	*
1927	10,932	86,101			
1928	14,628	93,745	Totals	162,773	$1,065 392

* Annual details concealed under 'Unapportioned.'

FLUORSPAR

Bibliography: State Mineralogist Reports XVII, XVIII, XVIV, XXVI, XXXVIII-XXXIX, XLI. Bulletins 67, 91. Eng. & Min. Jour.-Press, Vol. 177, pp. 489-492, Mar. 22, 1924.

During 1945 a small amount of fluorspar was mined and placed in a stockpile at the Red Bluff Fluorspar Mine 14 miles south of Rice, Riverside County. The same property made shipments in 1944. The annual details are concealed under the 'Unapportioned' item so as not to reveal the output of an individual operator.

Fluorspar, or calcium fluoride, CaF_2, is one of the most important nonmetallic minerals from an industrial standpoint. About 80 percent of the commercial mineral is prepared in the 'gravel' form and utilized as a flux in the manufacture of steel, for which use no substitute has yet been found.

In California deposits have been reported in Los Angeles, Mono, Riverside and San Bernardino counties. A previous commercial production was made in 1917-1918, when a total of 79 tons valued at $991 was shipped from Riverside County, and in 1933-1934 with 227 tons worth $3,631 coming from San Bernardino County.

Present quotations (Metal and Mineral Markets, Sept. 13, 1945) are: not less than 85 percent CaF_2 and not over 5 percent SiO_2, $33 per ton; No. 2 lump, $33 per ton, and acid grade 97.5 percent CaF_2, $37 f.o.b. mine.

GARNET (Abrasive)

During 1945 abrasive garnets were reported shipped from a property in Mono County north of Bishop; the annual details were concealed under the 'Unapportioned' item so as not to reveal the output of an individual. The 1945 production was somewhat larger than the

last reported output which was in 1939. In 1938 and 1939 shipments of garnets were made to the extent of 223 short tons worth $3,375. This was the first commercial production reported in California. The annual figures are concealed under the 'Unapportioned' item so as not to reveal the output of the operator.

Most garnets are utilized on paper and cloth used for woodworking and shoe manufacture and in sand-blasting.

Massive deposits of garnet have been noted in several places in California but little has been done to commercialize them owing to the lack of a market. Recently garnet tailings from some of the tungsten mines have been utilized in airplane factories.

GEMS

Bibliography: State Mineralogist Reports II, XIV, XV, XVII, XVIII, XX, XXI-XXVIII (inc.), XXX-XXXII (inc.), XXXIV-XXXV, XL-XLI. Bulletins 37, 67, 91. U. S. G. S., 'Mineral Resources of the U. S.'; Bull. 603, p. 208. Bull. Dept. Geo. Univ. of Cal., Vol. 5, pp. 149-153, 331-380. Am. Jour. Sci., Vol. 31, p. 31.

The production of gem materials in California has been somewhat irregular and uncertain since 1911. The compilation of complete statistics is difficult owing to widely-scattered places at which stones are gathered and marketed, for the most part in a small way. The gem material reported mined and shipped during 1945 in California came from a single property each in Imperial and Santa Clara counties, the annual details are concealed under the 'Unapportioned' item so as not to reveal the output of either producer. The material reported for the year was jasper and optical calcite. The 1944-1945 output had a total value of $21,075. In 1944 the total production was optical and piezo-electric quartz and came from Calaveras and Tulare counties.

Varieties of California's Gem Stones

Diamonds have been found in a number of localities in California; but in every case, they have been obtained in stream gravels while working them for gold. The principal districts have been: Volcano in Amador County; Placerville, Smith's Flat and others in El Dorado County; French Corral, Nevada County; Cherokee Flat, Morris Ravine, and Yankee Hill, Butte County; Gopher Hill and upper Spanish Creek, Plumas County. The most productive district of recent years has been Cherokee in Butte County.

California *tourmalines* are decidedly distinctive in coloring and 'fire' as compared to foreign stones of this classification. The colors range from deep ruby to pink, and various shades of green, also blue.

One of our California gem stones, *benitoite*, has not been found elsewhere; and in but a single locality here: The Dallas Mine in San Benito County.

Kunzite, a gem variety of spodumene, was first found in the Pala district in San Diego County. It has thus far been found in only one locality (Madagascar) outside of California. It is of a lilac color, and is described in detail in Bulletin 37 of the State Mining Bureau.

Beryls of excellent fire and delicate colors are also obtained in the pala district, of which the *aquamarine* (blue) and *morganite* (pink) varieties deserve special mention. Morganite, like kunzite, has thus far been found elsewhere only in Madagascar.

Californite, or 'California jade,' is a gem variety of *idocrase* (*vesuvianite*), and is green or white in color. It is found in Butte, Fresno, and Siskiyou counties.

Stones of precious blue *topaz* of fine quality are being cut from crystals mined in northern San Diego County. They are associated with beryl and blue tourmaline.

Some *rhodonite* has been mined in Siskiyou County, and used for decorative purposes, its value being included in the marble figures.

Garnets are found in a number of localities in California; the important yield of gems being *hyacinth* and *spessartite* varieties from San Diego County.

Chrysoprase has been produced in Tulare County.

Turquoise has been found in the desert section of San Bernardino County, but none produced commercially in recent years.

Sapphires have been reported found in San Bernardino and Riverside counties, but not as yet confirmed. A few have been found in stream gravels with diamonds in Butte County.

Rubies have been identified by the laboratory of the State Mining Bureau, occurring in limestone from the Baldy Mountains, San Bernardino County. Thus far no stones of commercial size have been taken out.

Total Production of Gem Materials in California

The value of the gem output in California annually since the beginning of commercial production is as follows:

Year	Value	Year	Value
1900	$20,500	1924	$4,800
1901	40,000	1925	10,663
1902	162,100	1926	9,049
1903	110,500	1927	7,035
1904	136,000	1928	22,200
1905	148,500	1929	26,850
1906	497,090	1930	3,540
1907	232,642	1931	5,607
1908	208,950	1932	4,961
1909	193,700	1933	690
1910	237,475	1934	2,456
1911	51,824	1935	945
1912	23,050	1936	2,878
1913	13,740	1937	2,075
1914	3,970	1938	4,575
1915	3,565	1939	2,500
1916	4,752	1940	3,176
1917	3,049	1941	870
1918	650	1942	570
1919	5,425	1943	329,868
1920	36,056	1944	21,075
1921	10,954	1945	*
1922	1,312		
1923	13,220	Total value	$2,625,407

* Concealed under unapportioned.

GRANITE

Bibliography: State Mineralogist Reports X, XII-XXVI (inc.), XXVII, XXXI, XXXV-XXXIX (inc.), XLI. Bulletin 38.

The 1945 output of granite in California had a total value of $220-411, as compared with a total value of $222,943 in 1944. The 1945 production was 32,936 cubic feet of monumental and building stone, valued at $207,921, the remainder being a small amount of curbing and some tuff, and volcanic rock used as building stone. The above came from two quarries in Placer and San Diego counties, and one quarry each in Fresno, Lassen, Riverside, Sacramento, San Bernardino, and Sonoma counties. The material from Sonoma County was tuff.

In recent years there has been a steady decline in the production of granite and other building stone, owing to the increase of concrete construction, which is steadily replacing stone.

Varieties

For building purposes, the granite found in California, particularly the varieties from Raymond in Madera County, Rocklin in Placer County and near Porterville in Tulare County, are unexcelled by any similar stone found elsewhere. The quantities available, notably at Raymond and Porterville, are unlimited. Most of California's 'granite,' particularly that found in the Sierra Nevada Mountains, is technically 'granodiorite' (that is, both plagioclase and orthoclase feldspars are present).

Granites of excellent quality for building and ornamental purposes are also quarried in Riverside, San Bernardino, and San Diego counties. Near Lakeside, San Diego County, is a fine-grained, 'silver gray' granite of uniform texture and color, especially suited for monumental and ornamental work.

The Fresno County stone is a dark, hornblende diorite, locally called 'black granite,' whose color permits of a fine contrast of polished and unpolished surfaces, making it particularly suitable for monumental and decorative purposes. Similar 'black granite' occurs in Tulare County, near Success.

Granite Production of California, by Years

The value of granite produced, annually, since 1887 has been as follows:

Year	Value	Year	Value
1887	$150,000	1918	$139,861
1888	57,000	1919	220,743
1889	1,329,018	1920	495,732
1890	1,200,000	1921	725,901
1891	1,300,000	1922	676,643
1892	1,000,000	1923	760,081
1893	531,322	1924	1,211,046
1894	228,816	1925	1,853,859
1895	224,229	1926	655,332
1896	201,004	1927	1,398,443
1897	188,024	1928	763,996
1898	147,732	1929	1,169,271
1899	141,070	1930	855,477
1900	295,772	1931	636,741
1901	519,285	1932	398,676
1902	255,239	1933	183,706
1903	678,670	1934	249,083
1904	467,472	1935	339,917
1905	353,837	1936	244,243
1906	344,083	1937	207,738
1907	373,376	1938	131,386
1908	512,923	1939	145,194
1909	376,834	1940	198,896
1910	417,898	1941	261,661
1911	355,742	1942	186,872
1912	362,975	1943	148,160
1913	981,277	1944	222,843
1914	628,786	1945	220,411
1915	227,928		
1916	535,339	Total value	$29,309,660
1917	221,997		

GRAPHITE

Bibliography: State Mineralogist Reports XVIII, XIV, XV, XVII, XXVI (inc.), XXX, XXXIII, XXXV, XXXVIII-XL (inc.) Bulletins 67, 91. U. S. G. S., Min. Res. 1914, Pt. II.

Graphite (also called plumbago) has been produced from time to time in the State, coming principally from Sonoma and Los Angeles Counties.

Occurrences of graphite have been reported at various times from Calaveras, Fresno, Imperial, Inyo, Los Angeles, Mendocino, San Bernardino, San Diego, Siskiyou, Sonoma and Tuolumne counties. From 1931 to 1933 a small production of graphite came from a property in Los Angeles County.

During 1943 no production of graphite was reported in California. In 1935 there was a small output of graphite coming from a single property in Los Angeles County. This material was used for experimental purposes. The annual details are concealed under the 'Unapportioned' item in order not to reveal the output of the single operator.

The principal value of graphite is on account of its infusibility and resistance to the action of molten metals. It is also largely used in the manufacture of electrical appliances, of 'lead' pencils, as a lubricant, as stove polish, paints and in many other ways. Amorphous graphite, commonly carrying many impurities, brings a much lower price. For

some purposes, such as foundry facings, etc., the low-grade material is satisfactory. Among the interesting uses for graphite is the prevention of formation of scale in boilers. The action is a mechanical one. Being soft and slippery, the graphite prevents the particles of scale from adhering to one another or to the boiler and they are thus easily removed.

Graphite Production of California, by Years

According to the records of the State Mining Bureau, the graphite production of California, by years, has been as follows:

Year	Pounds	Value	Year	Pounds	Value
1901	128,000	$4,480	1923		
1902	84,000	1,680	1925		
1903			1926	*76,000	$13,120
1913	2,500	25	1927		
1914			1928		
1915			1931		
1916	29,196	2,335	1932	*156,000	1,950
1917			1933		
1918			1934		
1919	*770,000	37,225	1935	104,000	520
1920			1936		
1921					
1922	*624,000	26,160	Totals	1,973,690	$87,495

* Annual details concealed under 'Unapportioned,' on account of a single producer.

GYPSUM

Bibliography: State Mineralogist Reports XIV, XV, XVII, XVIII, XXII, XXIII, XXV-XXVIII (inc.), XXX, XXXI, XXX-XXXVI (inc.), XXXVIII-XLI (inc.). Bulletins 38, 67, 91. U. S. Geol. Surv., Bull. 223, 413, 430, 697. U. S. Bur. of Standards, Circular No. 281.

Shipments of gypsum in California during 1945 amounted to a total of 442,133 net tons worth $954,696 and came from two properties each in Imperial and Kern counties; and one property each in Monterey, Riverside, and Ventura counties. The 1945 output showed an increased value with a decrease in amount as compared with that of 1944, this was accounted for by a larger percentage of highgrade gypsum compared with gypsite, and most producers of gypsum reported a higher unit value. The 1944 totals were 558,488 tons valued at $949,833. In addition to the above figures a considerable amount of gypsum came from Alameda County, which was obtained in a chemical process for reducing magnesium salts from salt-works bittern-water with lime, the amount of which was not included in the above figures as it was used with limestone and magnesia. The 1945 value is the largest of any annual output so far reported. The gypsum mined in the State is used in the manufacture of hard-wall and other plasters, wallboard, in cement, and for agricultural purposes. The increase in recent years in the uses of this material is chiefly in the agricultural field, the tonnage for which now exceeds that for industrial and structural plasters, and that used in cement.

Uses

The most important use of gypsum from the quantity standpoint is in the calcined form where it is utilized in the manufacture of various hard-wall plasters and plaster board. As plaster of paris, it plays a very important part in surgical work. Approximately 2%, by weight, raw gypsum is added in the manufacture of Portland cement just before the final grinding. In this application, the gypsum acts as a retarder to the set of the cement. The use of gypsum tile for non-bearing fireproof partitions, stairway and elevator enclosures, and the protection of steel columns, girders and beams, has increased greatly.

Keene's cement is a gypsum product, calcined to complete dehydration, and an accelerator added such as alum, potassium sulphate, borax, aluminum sulphate.

Land plaster may be applied to the soil by drilling, or scattered in the hill, or it may be sowed broadcast, in quantities ranging from 200 to 500 pounds to the acre.

Total Production of Gypsum in California

Production of gypsum annually in California since such records have been compiled by this Bureau is as follows:

Year	Tons	Value	Year	Tons	Value
1887	2,700	$27,000	1917	30,825	$56,840
1888	2,500	25,000	1918	19,695	37,176
1889	3,000	30,000	1919	19,813	50,579
1890	3,000	30,000	1920	20,507	92,535
1891	2,000	20,000	1921	37,412	78,875
1892	2,000	20,000	1922	47,084	188,336
1893	1,620	14,280	1923	86,410	289,136
1894	2,446	24,584	1924	25,569	53,210
1895	5,158	51,014	1925	107,613	172,444
1896	1,310	12,580	1926	114,868	211,337
1897	2,200	19,250	1927	94,630	292,090
1898	3,100	23,600	1928	104,790	200,567
1899	3,663	14,950	1929	140,844	396,951
1900	2,522	10,088	1930	116,865	243,507
1901	3,875	38,750	1931	88,354	199,198
1902	10,200	53,500	1932	46,867	93,818
1903	6,914	46,441	1933	59,235	120,451
1904	8,350	56,592	1934	58,149	113,606
1905	12,859	54,500	1935	70,833	151,807
1906	21,000	69,000	1936	143,549	282,703
1907	8,900	57,700	1937	186,160	384,431
1908	34,600	155,400	1938	161,996	327,821
1909	30,700	138,176	1939	219,672	437,343
1910	45,294	129,152	1940	314,843	599,944
1911	31,457	101,475	1941	432,784	854,184
1912	37,529	117,388	1942	425,268	791,892
1913	47,100	135,050	1943	475,967	916,883
1914	29,734	78,375	1944	558,488	949,833
1915	20,200	48,953	1945	442,133	954,696
1916	33,384	59,533			
			Totals	5,071,568	$11,204,524

LIME

Bibliography: State Mineralogist Reports XIV, XV, XVII-XXIX (inc.), XXXIII-XXXV (inc.). Bulletin 38.

The early output of lime in California was used entirely for structural purposes. Later a small percentage was put out for chemical, agricultural, and industrial uses, and still later lime replaced limestone in metallurgy. In 1942 the structural use had decreased to such a point and other uses increased to where they required the largest part of the lime burnt in this State, so it was decided to include lime with 'industrial' limestone in this statistical report.

Lime Production of California, by Years

The following tabulation gives the amounts and value of lime produced in California by years since 1894 when compilation of such records was begun by the State Mining Bureau. The figures for quantity have been recalculated from 'barrels,' as shown in the earlier reports, to 'tons' for the years 1894-1922 (inc.):

Year	Tons	Value	Year	Tons	Value
1894	37,350	$318,700	1919	42,070	$552,043
1895	39,776	386,094	1920	46,314	557,232
1896	30,275	261,505	1921	46,353	610,619
1897	28,780	252,900	1922	57,875	671,747
1898	29,786	254,010	1923	70,894	788,834
1899	29,985	314,575	1924	62,029	703,355
1900	31,252	283,699	1925	61,922	685,528
1901	31,738	334,688	1926	63,568	670,837
1902	44,866	369,616	1927	60,498	631,497
1903	49,659	418,280	1928	56,616	547,919
1904	57,945	571,749	1929	42,834	417,101
1905	61,700	555,322	1930	47,662	452,084
1906	68,927	763,060	1931	36,189	360,523
1907	68,422	756,376	1932	27,510	254,223
1908	39,639	379,243	1933	33,425	271,619
1909	52,075	577,824	1934	32,500	309,765
1910	47,951	477,683	1935	59,731	573,212
1911	42,959	390,988	1936	64,275	633,678
1912	52,212	464,440	1937	69,532	681,277
1913	61,344	528,547	1938	70,578	683,403
1914	43,996	378,663	1939	87,288	849,122
1915	35,653	286,304	1940	101,395	902,322
1916	49,364	390,475	1941	110,719	996,514
1917	50,073	311,380			
1918	43,684	461,315	Totals	2,481,188	$24,311,890

LIMESTONE

Bibliography: State Mineralogist Reports IV, XII-XV (inc.), XVII-XXXI (inc.), XXXIII-XXXV (inc.), XXXII, XLI (inc). Bulletins 38, 91. Oregon Agr. College Extension Bulletin 305. Eng. and Min. Jour.-Press, Vol. 120, pp. 249-253.

'Industrial' limestone was shipped from 22 properties in 14 counties during 1945 and totaled 532,480 net tons, valued at $1,626,844, as compared with 734,425 tons, worth $1,714,414, in 1944 which came from

18 properties in 10 counties. Distribution of the 1945 output by counties was as follows:

County	Amount	Value
San Bernardino	121,183	$285,827
Santa Clara[a]	45,274	138,122
Alameda[a], Amador, El Dorado, Inyo, Riverside, San Luis Obispo, San Mateo[a], Santa Cruz, Shasta, Siskiyou, Tuolumne, Ventura*	366,023	1,202,895
Totals	532,480	$1,626,844

[a] Includes shells dredged from San Francisco Bay.
* Combined to conceal the output of operators in each.

Included in the above figures are 183,643 tons of limestone used in making 91,825 net tons of lime, valued at $997,236, which came from two properties in San Bernardino County and one each in Alameda, El Dorado, Santa Cruz and Tuolumne counties. The figures for lime do not include lime burnt from dolomite and used in the reduction of magnesia from sea water. Dolomite is treated as a separate mineral substance. In 1944 there were 164,494 tons of limestone burnt to make 82,247 net tons of lime, valued at $883,009. Also included were 83,856 tons of limestone, valued at $503,817, which was used for agricultural purposes and poultry grit, stock feed and as a filler in fertilizers. The amount here does not include the limestone used in the manufacture of cement nor for macadam and as aggregate for concrete, but accounts for that utilized as smelter and foundry flux, for glass and sugar making, other special chemical and manufacturing processes and burned for lime. It also includes that utilized for fertilizers (agricultural 'lime'), 'roofing gravel,' paint and concrete filler, whiting for paint, putty, kalsomine, terrazzo, paving dust, chicken grit, stock feed, carbon dioxide gas, oil wells, mineral wool, 'paving compound,' facing dust for concrete pipe, also for rubber and magnesite mix.

The above limestone for 1945 was produced by four companies in San Bernardino County; three in Santa Clara County; two each in El Dorado, Santa Cruz and Tuolumne counties; and one each in Alameda, Amador, Inyo, Riverside, San Luis Obispo, San Mateo, Shasta, Siskiyou, and Ventura counties. The material from Alameda and San Mateo counties and part from Santa Clara County was shells, dredged from San Francisco Bay, which were ground and used for agricultural purposes, chemical purposes, and for poultry grit.

Limestone Production of California, by Years

The following tabulation gives the amounts and values of 'industrial' limestone produced in California by years since 1894 when compilation of such records was begun by the State Mining Bureau. These tonnages consist principally of limestone utilized for flux, glass and sugar making, agricultural, chemical, and other special industrial purposes. That utilized in cement manufacture is not included. Beginning

with 1942 the limestone used in the manufacture of burnt lime was included with these figures, instead of being kept separate as a structural material, as most of the lime is being used in metallurgical and chemical industry, and not in construction as in previous years.

Year	Tons	Value	Year	Tons	Value
1894	15,420	$19,275	1921	75,921	$305,912
1895	71,355	71,690	1922	84,382	282,181
1896	68,184	71,112	1923	143,266	348,464
1897	36,796	38,556	1924	219,476	582,660
1898	27,686	24,548	1925	319,977	494,525
1899	30,769	29,185	1926	108,795	367,501
1900	32,791	31,532	1927	699,790	663,957
1901	76,937	99,445	1928	127,895	397,935
1902	71,422	90,524	1929	168,315	557,617
1903	125,919	163,988	1930	169,477	508,751
1904	40,207	87,207	1931	177,268	560,699
1905	192,749	323,325	1932	168,950	487,788
1906	80,262	162,827	1933	207,371	487,712
1907	230,985	406,041	1934	198,057	461,139
1908	273,890	297,264	1935	227,214	496,054
1909	337,676	419,921	1936	295,792	661,757
1910	684,635	581,208	1937	351,755	830,562
1911	516,398	452,790	1938	302,665	729,149
1912	613,375	570,248	1939	316,029	838,235
1913	301,918	274,455	1940	563,999	895,832
1914	572,272	517,713	1941	459,153	801,868
1915	146,324	156,288	1942	474,764	1,155,352
1916	187,521	217,733	1943	495,262	1,378,647
1917	237,279	356,396	1944	734,425	1,714,414
1918	208,566	456,258	1945	532,480	1,626,844
1919	88,291	248,145			
1920	90,120	298,197	Totals	12,982,225	$24,101,426

LITHIA

Bibliography: State Mineralogist Reports II, IV, XIV, XXI, XXX, XXXV, XXXIX. Bulletins 38, 67, 91.

During 1945 lithium salts were again produced in California but came from a single property, and the figures are concealed under the 'Unapportioned' item. The 1945 output had the largest value of any annual production so far reported in this State.

Starting with 1938, material came from the brines of Searles Lake in San Bernardino County at the plant of the American Potash and Chemical Corporation, in the form of sodium-lithium phosphate, and is the first output of this form, previous production being the mineral lepidolite.

Lithia mica, lepidolite (a silicate of lithium and others), utilized in the manufacture of artificial mineral water, fireworks, glass, etc., has been mined in San Diego County since 1899, except between 1905 and 1915, though none was shipped in 1923, 1925, 1929-1943 (inc.). During 1930 a small amount of lepidolite was mined in California, but not shipped. Some amblygonite, a lithium phosphate, is occasionally obtained from pockets associated with the gem tourmalines.

Lithia minerals total production in the State has been as follows:

Year	Tons	Value	Year	Tons	Value
1899	124	$4,600	1923		
1900	440	11,000	1924	109	$2,269
1901	1,100	27,500	1925		
1902	822	31,880	1926		
1903	700	27,300	1927 *	550	13,900
1904	641	25,000	1928		
1905	25	276	1929		
1906			1938		
1915	91	1,365	1939 *	378	100,338
1916	71	1,065	1940		
1917	880	8,800	1941 *	366	84,099
1918	4,111	73,998	1942		
1919	800	14,400	1943 *	478	114,148
1920	10,046	153,502	1944		
1921 *	1,365	20,781	1945 *	1,554	357,802
1922			Totals	24,651	$1,074,023

* Annual details concealed under 'Unapportioned.'

MAGNESITE

Bibliography: State Mineralogist Reports XII-XV (inc.), XVII-XXVII (inc.), XXX, XXXI, XXXIV, XXXVI-XXXVII, XXXIX-XLI (inc.). Bulletins 38, 79, 91. U. S. Geol. Surv., Bulletins 355, 540. Min. Res. 1913, Pt. II, pp. 450-453. Min. & Sci. Press, Vol. 114, p. 237. "Magnesite"—Hearings before Comm. on Ways and Means, House of Repr., on H. R. 5218, June 16, 17, and July 17, 1919. Eng. Soc. W. Penn., Proc. 1913, Vol. 29, pp. 305-388, 418-444. Eng. & Min. Jour.-Press, Vol. 114, July 29, and Dec. 2, 1922. U. S. Tariff Comm., "Crude and Caustic Calcined Magnesite. A Preliminary Statement of Information," May 19, 1926.

During 1945 magnesite was produced in California from a single property in Santa Clara County. The annual details are concealed under the 'Unapportioned' item so as not to reveal the output of a single company. Practically all the above was shipped in the calcined form.

The 1942-1943 output of magnesite in California showed a total of 198,259 net tons of crude magnesite valued at $1,821,978, of which only a small amount was sold as such. Most of the material was calcined before being marketed. Operators reported a total of 74,099 tons calcined products valued at $2,991,681 f.o.b. rail shipping point was made during 1942-1943, and was deadburned for refractories and in part, material for the plastic trade.

In California the known deposits are mostly in the metamorphic rocks of the Coast Ranges and the Sierra Nevada, being associated with serpentine areas. The notable exceptions are the sedimentary deposits at Bissell in Kern County and at Afton in San Bernardino County. Several thousand tons have been shipped from the Bissel deposit; and small shipments have been made from the Afton property. Beginning in 1938, a portion of the market for calcined magnesite is being supplied by magnesium oxide produced from salt-works bitterns

at a plant at Newark, Alameda County, on San Francisco Bay and in 1942 a plant started operations at Moss Landing in Monterey County using sea water and dolomite to manufacture an artificial periclase. The figures for the crude of above tonnage are included under those for magnesium salts in the Salines chapter.

Total Magnesite Production of California

The first commercial production of magnesite in California was made in the latter part of 1886 from the Cedar Mountain district,[1] southeast of Livermore, Alameda County. Shipments amounting to 'several tons' or 'several carloads' were sent by rail to New York; but there is apparently no exact record of the amount for that first year. The statistical records of the State Mining Bureau began with the year 1887, and the table herewith shows the figures for amount and value, annually, from that time. Shipments of magnesite from Napa County began in 1891 from the Snowflake Mine; from the Red Mountain deposits in Santa Clara County, in 1899; and from Tulare County in 1900.

Total Magnesite Production of California

Year	Tons	Value	Year	Tons	Value
1887	600	$9,000	1917	209,648	$1,976,227
1888	600	9,000	1918	83,974	803,492
1889	600	9,000	1919	44,696	452,098
1890	600	9,000	1920	83,695	1,033,491
1891	1,500	15,000	1921	47,837	511,102
1892	1,500	15,000	1922	55,637	594,665
1893	1,093	10,930	1923	73,963	946,643
1894	1,440	10,240	1924	67,236	900,183
1895	2,200	17,000	1925	64,623	872,944
1896	1,500	11,000	1926	50,915	587,642
1897	1,143	13,671	1927	46,093	577,887
1898	1,263	19,075	1928	45,645	501,590
1899	1,280	18,480	1929	47,269	488,014
1900	2,252	19,333	1930	38,681	388,472
1901	4,726	43,057	1931	21,576	182,283
1902	2,830	20,655	1932	* 40,303	282,325
1903	1,361	20,515	1933		
1904	2,850	9,298	1934	* 62,509	413,228
1905	3,933	16,221	1935		
1906	4,032	40,320	1936	* 94,491	734,443
1907	6,405	57,720	1937		
1908	10,582	80,822	1938	* 47,954	375,005
1909	7,942	62,588	1939		
1910	16,570	113,887	1940	* 241,620	2,069,220
1911	8,858	67,430	1941		
1912	10,512	105,120	1942	* 198,259	1,821,978
1913	9,632	77,056	1943		
1914	11,438	114,380	1944	*	*
1915	30,271	283,461	1945	*	*
1916	154,052	1,311,893	Totals	1,970,189	$19,123,084

* Combined under 'Unapportioned.'

[1] See U. S. Geol. Surv.; Mineral Resources of U. S., 1886, pp. 6 and 696.

MARBLE

Bibliography: State Mineralogist Reports XII-XV (inc.), XVII-XXX (inc.), XXXIV, XXXV, XXXVII, XXXVIII, XL. Bulletin 38. U. S. Bur. of Mines Bull. 106.

In recent years the marble output has been showing a steady decline as has that of other building stone. The presence of artificial marbles and of terrazzo which are cheaper is probably the major factor for this. During 1945 no marble was reported quarried in California. The only years that no output was reported since 1887, when the first record of the marble industry was made in the State, were 1934 and 1945. In 1944 a production was reported from a single property in Inyo County; the annual details were concealed under the 'Unapportioned' item so as not to reveal the output of an individual.

California has many beautiful and serviceable varieties of marble, suitable for almost any conceivable purpose of construction or decoration. In the decorative class are deposits of onyx marble of beautiful coloring and effects. Serpentine marble suitable for electrical switchboard use is available also.

Marble Production of California, by Years

Data on annual production since 1887, as compiled by the State Mining Bureau, follow. Previous to 1894 no records of amounts were preserved.

Total Production of Marble in California, by Years

Year	Cubic feet	Value	Year	Cubic feet	Value
1887		$5,000	1917	24,755	$62,950
1888		5,000	1918	[a]17,428	49,898
1889		87,030	1919	25,020	74,482
1890		80,000	1920	[b]29,531	92,899
1891		100,000	1921	30,232	98,395
1892		115,000	1922	38,321	127,792
1893		40,000	1923	28,015	124,919
1894	38,441	98,326	1924	[b]61,579	140,253
1895	14,864	56,566	1925	35,664	116,105
1896	7,889	32,415	1926	34,806	119,999
1897	4,102	7,280	1927	[b]42,308	103,689
1898	8,050	23,594	1928	[b]34,324	82,190
1899	9,682	10,550	1929	[b]72,881	93,661
1900	4,103	5,891	1930	[b]65,775	82,194
1901	2,945	4,630	1931	[b]37,776	81,760
1902	19,305	37,616	1932	[b]25,506	42,505
1903	84,624	97,354	1933	[b]9,039	23,178
1904	55,401	94,208	1934	[b]7,185	10,759
1905	73,303	129,450	1935	(b)	9,884
1906	31,400	75,800	1936	(b)	23,011
1907	37,512	118,066	1937	(b)	23,667
1908	18,653	47,665	1938	[a] (b)	6,015
1909	79,600	238,400	1939	(b)	14,822
1910	18,960	50,200	1940	(b)	15,189
1911	20,201	54,103	1941	(b)	14,448
1912	27,820	74,120	1942	(b)	580
1913	41,654	113,282	1943		
1914	25,436	48,832	1944	*	*
1915	22,186	41,518	1945		
1916	25,954	50,280			
			Total value		$3,577,420

[a] Includes onyx and serpentine.
[b] Includes onyx and travertine.

MICA

Bibliography: State Mineralogist Reports II, IV, XXVI-XXVIII (inc.), XXX, XXXIII-XXXVI (inc.), XXXVIII, XL. Bulletins 38, 67, 91. U. S. Geol. Surv., Bull. 740; Min. Res. of U. S. Eng. & Min. Jour.-Press, Vol. 115, pp. 55-60, Jan. 13, 1923.

Sericite, a fine-grained variety of muscovite, has been produced continuously since 1929 in California with the exception of 1934, 1939, 1942, and 1943. The 1945 shipments came from a single property in Imperial County and were sericite mica schist.

The annual details are concealed in the 'Unapportioned' items so as not to reveal production of the individual operators. Sericite is used as a cheap grade of ground mica for roofing, as a refractory, foundry facing, and decorative material to imitate snow. A small amount of vermiculite, a hydrous mica, expanded by heating and then used as an insulating agent, was mined in 1936.

Classification and Uses

Practically all marketable mica is of the muscovite or phlogopite varieties. There are three main commercial classes: Sheet mica, including punch; splittings, and scrap. Sheet mica is used chiefly for electrical purposes and for glazing; splittings are made into built-up mica; scrap is ground to a powder. Mica to be classified as sheet must yield a rectangle of at least 1½ x 2 in., must split evenly and freely, be free from cracks, rulings, or plications, and reasonably free from inclusions of foreign matter, though stains of a nonconducting character are permissible for some uses. Ability to withstand heat and high electrical resistance have led to a wide application of sheet mica in the electrical industries. The electrical uses of sheet mica greatly exceed all others in quantity and value of the material used.

As a heat-resisting transparent medium, sheet mica has various uses. It is widely employed for stove windows, though this use has declined to a considerable extent. A hard and rigid mica that is nearly clear is best suited for stove fronts. High-grade stove mica commands a higher price than electrical mica, because for the most part larger sizes are demanded. Mica is also used in furnace and bake-oven sight-holes, heat screens, lamp chimneys, canopies and shades, particularly for gas mantels, and also for military lanterns and in lantern slides.

Its ability to withstand shocks and strains, combined with its transparency, has led to wide use in spectacles, divers' helmets, smoke helmets, compass cards, gage fronts, and in windows subject to shock, as in the conning towers of warships. On account of its heat-resisting qualities, ground mica is used in railroad car axle packings, foundry facing in pipe and boiler coverings, in fireproof paints, and in rubber tires. Ground mica is used as a component in roofing, as a filler in rubber and other products, in foundry facing, calico printing and as a tire powder. It is used also in tinsel decorations, and as 'Santa Claus snow' for Christmas tree and window decorations. It is used as a lubricant for wooden bearings, and mixed with oil for metal bearings.

The vermiculite variety is any of several hydrous mica minerals which expand upon heating. In recent years they have become valuable as an insulating agent for both heat and sound; when expanded it often takes on a gold or silver color and is used in window decoration.

Production of mica in California has been as follows:

Year	Tons	Value	Year	Tons	Value
1902	50	$2,500	1937		
1903	50	3,800	1938*	4,969	$31,751
1904	50	3,000	1939		
1929			1940		
1930*	2,240	15,260	1941*	1,469	11,050
1931			1942		
1932			1944	*	*
1933*	1,957	13,963	1945	*	*
1934					
1935			Totals	14,618	$96,974
1936*	3,833	15,650			

* Annual details concealed under 'Unapportioned.'

MINERAL PAINT

Bibliography: State Mineralogist Reports XII-XIX (inc.), XXI, XXII-XXVIII (inc.), XXXV, XXXVII. Bulletins 38, 91.

During 1945 in California shipments of mineral paint were made from a single property in San Bernardino County. The annual details are concealed under the 'Unapportioned' item so as not to reveal the output of the individual producer. The 1933-1934 total output was 590 short tons valued at $7,700.

The 1944 output came from a single property each in Madera and San Bernardino Counties.

These materials have been reported as coming from Alameda, Amador, Butte, Calaveras, Colusa, Los Angeles, Madera, Napa, Placer, Riverside, San Bernardino, Shasta, Sonoma, Stanislaus, and Ventura counties. Other deposits may have value, but as yet there have been no commercial shipments from El Dorado, Imperial, Kern, Kings, Lake, Mendocino, San Diego, Siskiyou, Trinity, and Yuba counties, in which they are found.

Mineral Paint Production of California, by Years

The first recorded production of mineral paint materials in the State was in the year 1890. The output, showing annual amount and value since that time, is given herewith:

Year	Tons	Value	Year	Tons	Value
1890	40	$480	1917	520	$2,700
1891	22	880	1918	728	4,738
1892	25	750	1919	1,780	17,055
1893	590	26,795	1920	779	8,477
1894	610	14,140	1921	446	4,748
1895	750	8,425	1922	1,620	13,277
1896	395	5,540	1923	1,049	11,773
1897	578	8,165	1924	532	5,234
1898	653	9,698	1925	669	6,969
1899	1,704	20,294	1926	569	5,846
1900	529	3,993	1927		
1901	325	875	1928 *	919	9,592
1902	589	1,533	1929	467	2,820
1903	2,370	3,720	1930		
1904	270	1,985	1931 *	250	3,000
1905	754	4,025	1932		
1906	250	1,720	1933		
1907	250	1,720	1935 *	570	5,500
1908	335	2,250	1936		
1909	305	2,325	1937	855	5,193
1910	200	2,040	1938		
1911	186	1,184	1941		
1912	300	1,800	1942 *	145	1,458
1913	303	1,780	1943		
1914	132	847	1944 *	590	7,700
1915	311	1,756	1945	*	*
1916	643	3,960			
			Totals	25,907	$248,760

* Annual details concealed under 'Unapportioned.'

MINERAL WATER

Bibliography: State Mineralogist Reports VI, XII-XVIII (inc.), XXI-XXIX (inc.), XXXI, XXXIII (inc.), XXXV-XXXVII, XXXIX (inc.), U. S. G. S. Water Supply Paper 338. Min. Res., 1914, 1916. 'Mineral Springs and Health Resorts of California' by Dr. Winslow Anderson, 1890. U. S. Dept of Agr., Bureau of., Chem., Bulletin 91.

A widespread production of mineral water is shown annually in California. These figures refer to mineral water actually bottled for sale, or for local consumption. Water from some of the springs having a special medicinal value brings a price many times higher than the average shown, while in some cases the water is used merely for drinking purposes and sells for a nominal figure. Health and pleasure resorts are located at many of the springs. The waters of some of the hot springs are not suitable for drinking, but are very efficacious for bathing. California is particularly rich in mineral springs.

The commercial output of mineral water in California during 1945 amounted to a total of 26,502,875 gallons, valued at $798,430, as compared with 24,445,814 gallons, worth $812,645 in 1944. The 1945 output came from springs and wells on 28 properties in 13 counties, and was distributed as follows:

County	Gallons	Value
Lake	8,700	$2,012
Los Angeles	11,643,290	423,378
Butte, Calaveras, Contra Costa, Marin, Napa, Riverside, San Bernardino, San Diego, San Luis Obispo, Siskiyou, Sonoma*	14,850,885	373,430
Totals	26,502,875	$798,820

* Combined to conceal the output of producers in each.

The production above tabulated came either from springs or artesian wells and was bottled, in part with artificial carbonation, but mostly natural, and sold for drinking purposes. A large part was used in the preparation of soft drinks with flavors.

Mineral Water Production of California, by Years

Mineral water was bottled for sale at the Napa Soda Springs, Napa County, as early as 1856,[1] and at other springs in California, notably The Geysers, Sonoma County, also at early dates; but no figures are available earlier than the year 1887. Amount and values, annually, since that year are shown herewith:

Year	Gallons	Value	Year	Gallons	Value
1887	618,162	$144,368	1917	1,942,020	$340,566
1888	1,112,202	252,990	1918	1,808,791	375,650
1889	808,625	252,241	1919	2,233,842	340,117
1890	258,722	89,786	1920	2,391,791	421,643
1891	334,553	139,959	1921	3,446,278	367,476
1892	331,875	162,019	1922	4,276,346	486,424
1893	383,179	90,667	1923	5,487,276	616,919
1894	402,275	184,481	1924	8,159,211	818,726
1895	701,397	291,500	1925	12,115,072	1,230,455
1896	808,843	337,434	1926	14,074,877	1,171,550
1897	1,508,192	345,863	1927	16,644,423	1,487,183
1898	1,429,809	213,817	1928	25,049,002	1,304,969
1899	1,338,537	406,691	1929	27,032,083	2,040,615
1900	2,456,115	268,607	1930	37,354,111	2,870,663
1901	1,555,328	559,057	1931	26,164,331	1,347,860
1902	1,701,142	612,477	1932	19,031,224	1,495,988
1903	2,056,340	558,201	1933	15,650,406	719,746
1904	2,430,320	496,946	1934	19,882,436	1,071,197
1905	2,194,150	538,700	1935	16,659,254	940,333
1906	1,585,690	478,186	1936	19,348,513	777,899
1907	2,924,269	544,016	1937	18,309,729	1,130,810
1908	2,789,715	560,507	1938	26,900,959	853,998
1909	2,449,834	465,488	1939	16,678,741	735,988
1910	2,335,259	522,009	1940	16,190,549	960,701
1911	2,637,669	590,654	1941	17,746,256	988,520
1912	2,497,794	529,384	1942	17,559,686	567,897
1913	2,350,792	599,748	1943	22,022,314	814,700
1914	2,443,572	476,169	1944	24,445,814	812,645
1915	2,274,267	467,738	1945	26,502,875	798,430
1916	2,273,817	410,112			
			Totals	514,100,694	$39,469,482

[1] Cronise, T. F., The natural wealth of California, p. 182, 1868.

ONYX AND TRAVERTINE

Bibliography: State Mineralogist Reports XII-XV (inc.), XVII, XVIII, XXI, XXIII, XXXI, XXXIV, XL. Bulletin 38.

Onyx and travertine are known to exist in a number of places in California, but only a small and irregular production has been made since the year 1896. During 1944 no onyx or travertine was reported shipped. In 1942 there was one producer of travertine in Solano County, the figures of which are combined with marble. This material is used in terrazzo and for ornamental purposes.

Onyx Production of California, by Years

Production by years has been as follows:

Year	Value	Year	Value
1887	*	1927	*
1888	$900	1928	*
1889	900	1929	*
1890	900	1930	*
1891	1,500	1931	*
1892	2,400	1932	*
1893	1,800	1933	*
1894	27,000	1934	*
1895	20,000	1935	*
1896	12,000	1936	*
1918	24,000	1937	*
1919	*	1938	*
1920		1939	*
1921	1,294	1940	*
1922	3,320	1941	*
1923	2,510	1942	*
1924	*	1943	
1925	16,120		
1926	7,575	Total value	$122,219

* See under Marble.

PHOSPHATES

Bibliography: State Mineralogist Report XXI, XL. Bulletins 67, 91.

No commercial production of phosphates has been recorded from California, though occasional pockets of the lithium phosphate, amblygonite, Li (AlF) PO_4, have been found associated with the gem tourmaline deposits in San Diego County. Such production has been classified under lithia. In 1938, recovery began on a commercial scale of Sodium-lithium phosphate at the plant of the American Potash and Chemical Corporation, at Searles Lake, San Bernardino County. However, the product is sold for its lithium content rather than the phosphate, hence we record it under Lithia.

PUMICE and VOLCANIC ASH

Bibliography: State Mineralogist Reports XII, XIV, XV, XVII, XVIII, XXII-XXV (inc.), XXX-XXXII (inc.), XXXIV-LX (inc.). Bulletin 38. U. S. Bureau of Mines, I. C. 6560. (See 'Tufa.')

The output of pumice and volcanic ash in California during 1945 amounted to a total of 89,209 net tons, valued at $461,022 f.o.b. rail shipping point, compared with 34,525 tons, worth $272,064 in 1944.

The 1945 output consisted of 74,505 tons of pumice, worth $309,277, which came from four properties in Siskiyou County; two each in Contra Costa, Inyo, and Modoc counties; and one each in Madera, Mono, and Napa counties; and 14,704 tons of volcanic ash, worth $151,745, which came from two properties each in Kern and Madera counties. A small amount of the material classed as pumice coming from Siskiyou County was scoria.

The lump pumice was used for light-weight aggregate in concrete, acoustic plaster, abrasives, scouring bricks, insulating, and hen-house litter; while the volcanic ash or tuff was employed in making soap, cleanser compounds, as a filler in concrete, in asphalt, and as a carrier for insecticides in dry agricultural sprays. A portion of the Kern County ash is going into the preparation of one of the nationally advertised brands of cleanser compounds.

Pumice Production of California, by Years

Commercial production of pumice in California was first reported to the State Mining Bureau in 1909, then not again until 1912, since which year there has been a small annual output, as indicated by the following table:

Year	Tons	Value	Year	Tons	Value
1909	50	$500	1928	10,440	$105,055
1910			1929	10,449	76,123
1911			1930	12,947	128,847
1912	100	2,500	1931	11,711	108,130
1913	3,590	4,500	1932	9,891	86,034
1914	50	1,000	1933	8,243	61,067
1915	380	6,400	1934	9,951	54,748
1916	1,246	18,092	1935	14,890	87,055
1917	525	5,295	1936	17,132	143,709
1918	2,114	28,669	1937	10,392	79,005
1919	2,388	43,657	1938	18,783	105,207
1920	1,537	25,890	1939	41,109	159,951
1921	406	6,310	1940	35,162	126,516
1922	613	4,248	1941	85,309	283,663
1923	2,936	16,309	1942	55,603	209,539
1924	4,919	33,404	1943	21,154	142,665
1925	5,319	32,937	1944	34,525	272,064
1926	7,170	48,350	1945	89,209	461,022
1927	13,779	168,896			
			Totals	543,022	$3,137,357

PYRITES

Bibliography: State Mineralogist Reports XVIII, XIX, XXII, XXV, XXVI, XXX, XXXV, XXXIX-XL. Bulletins 38, 91. Min. & Sci. Press, Vol. 144, pp. 825, 840.

Pyrite shipped in California during 1945, came from a single property in Shasta County and showed a decrease in amount and value over that of 1944. The annual details are placed under 'Unapportioned' to conceal the output of the individual operator.

This material was mostly used in the manufacture of sulphuric acid for explosives and fertilizer. Some iron sulphate had been produced previously and was utilized directly in the preparation of an agricultural fertilizer and insecticide. The sulphur content ranged up to 50.8% S.

This does not include the large quantities of pyrite, chalcopyrite, and other sulphides which are otherwise treated for their valuable metal contents. Some sulphuric acid is annually made as a by-product in the course of roasting certain tonnages of Mother Lode auriferous concentrates while under treatment for their precious metal values.

Pyrites Production in California, by Years

The total recorded pyrites production in California to date is as follows:

Year	Tons	Value	Year	Tons	Value
1898	6,000	$30,000	1923	148,004	$555,308
1899	5,400	28,620	1924	124,214	517,835
1900	3,642	21,133	1925	129,500	528,550
1901	4,578	18,429	1926	100,896	466,088
1902	17,525	60,306	1927	130,910	564,823
1903	24,311	94,000	1928	90,566	400,627
1904	15,043	62,992	1929	79,169	363,717
1905	15,503	63,958	1930	39,958	194,228
1906	46,689	145,895	1931	25,402	131,174
1907	82,270	251,774	1932		
1908	107,081	610,335	1933 *	72,271	297,832
1909	457,867	1,389,802	1934		
1910	42,621	179,862	1935 *	157,129	547,754
1911	54,225	182,954	1936		
1912	69,872	203,470	1937 *	155,107	541,915
1913	79,000	218,537	1938		
1914	79,267	230,058	1939 *	127,604	452,901
1915	92,462	293,148	1940		
1916	120,525	372,969	1941 *	167,711	598,870
1917	111,325	323,704	1942		
1918	128,329	425,012	1943 *	234,596	1,001,966
1919	147,024	540,300	1944		
1920	146,001	530,581	1945 *	204,170	816,680
1921	110,025	473,735			
1922	151,381	570,425	Totals	4,105,173	$15,302,267

* Annual details concealed under 'Unapportioned.'

SANDSTONE

Bibliography: State Mineralogist Reports XII-XV, XVII, XVIII, XXI, XXIII, XXVI-XXVIII (inc.), XXXIV, XXXV, XL. Bulletin 38. U. S. Bur. of Mines, Bull. 124.

An unlimited amount of high-grade sandstone is available in California, but the wide use of concrete in buildings of every character, as well as the popularity of a lighter-colored building stone, has curtailed production in this branch of the mineral industry during recent years almost to the vanishing point. During 1945 sandstone was reported in California, coming from two quarries in Monterey County, and one each in Napa and Ventura counties and totaling 954 cubic yards valued at $7,498. In 1944 sandstone as reported in California came from two quarries in Monterey County. The annual details are concealed under the 'Unapportioned' item so as not to reveal the output of either producer. The 1943-1944 output totaled 1,124 cubic yards of sandstone valued at $7,415 at the quarry.

Practically all of the material was flagstone which is used in garden walks, fountains, walls and fireplaces to give effect to Spanish and English types of homes. The material reported from Monterey and San Luis Obispo counties is in reality an indurated shale of the Monterey series, of a cream color and utilized as a building stone, and that from Ventura County a red shale.

Sandstone Production of California, by Years

Amount of value, so far as contained in the records of this Bureau, are presented herewith, with total value from 1887 to date:

Year	Cubic feet	Value	Year	Cubic feet	Value
1887		$175,000	1917	31,090	$7,074
1888		150,000	1918	900	400
1889		175,598	1919	5,400	3,720
1890		100,000	1920	10,500	2,300
1891		100,000	1921	10,150	2,112
1892		50,000	1922	900	1,100
1893		26,314	1923	7,000	13,000
1894		113,592	1924	6,700	3,600
1895		35,373	1925	14,704	14,362
1896		28,379	1926	34,100	17,500
1897		24,086	1927	222,900	205,400
1898		46,384	1928	134,100	43,250
1899	56,264	103,384	1929	177,655	49,881
1900	378,468	254,140	1930	160,704	56,404
1901	266,741	192,132	1931	110,244	30,960
1902	212,123	142,506	1932	41,793	13,286
1903	353,002	585,309	1933	25,980	10,888
1904	363,487	567,181	1934	21,738	14,245
1905	302,813	483,268	1935	38,426	9,268
1906	182,076	164,068	1936	24,705	9,180
1907	159,573	148,148	1937	73,190	15,680
1908	93,301	55,151	1938	43,107	9,384
1909	79,240	37,032	1939	54,380	12,494
1910	165,971	80,443	1940	27,992	13,083
1911	255,313	127,314	1941	60,958	13,143
1912	66,487	22,574	1942	20,427	8,587
1913	62,227	27,870	1943*	30,672	7,415
1914	111,691	45,322	1944*		
1915	63,350	8,438	1945	25,758	7,498
1916	17,270	10,271			
			Total value		$4,674,491

* Under 'Unapportioned.'

SERPENTINE

Bibliography: State Mineralogist Report XV, XL. Bulletin 38.

Serpentine has not been produced in California to a very large extent at any time. A single deposit, that on Santa Catalina Island, has yielded the principal output to date. Some material was shipped from there in 1917 and 1918, being the only output recorded since 1907. It was used for decorative building purposes and for electrical switchboards. As there was but a single operator, the figures were combined with those of marble output for those years.

The production of serpentine prior to 1919 was 'verde antique' which is used as an ornamental stone and often classed as a marble. In recent years experimental tests have proved several possible commercial applications to which this mineral might be put such as an admix in cement, in the manufacture of magnesium chemicals, in terrazzo, as a substitute for soapstone, and as a filler. During 1938 a small shipment of serpentine was reported from one property in San Bernardino County. The annual details are concealed in the 'Unapportioned' item so as not to reveal the output of an individual. A plant is being constructed at Permanente to fuse serpentine and phosphate rock for fertilizers.

Serpentine Production of California, by Years

The following table shows the amount and value of serpentine from 1895 as recorded by this bureau:

Serpentine Production in California, by Years

Year	Cubic feet	Value	Year	Cubic feet	Value
1895	4,000	$4,000	1905		
1896	1,500	6,000	1906	847	$1,694
1897	2,500	2,500	1907	1,000	3,000
1898	750	3,000	1917	[a]	[a]
1899	500	2,000	1918	[b]	[b]
1900	350	2,000	1919		
1901	89	890	1938	[b]	[b]
1902	512	5,065			
1903	99	800			
1904	200	2,310	Totals	12,347	$33,259

[a] Under 'Unapportioned.'
[b] See under Marble.

SHALE OIL

Bibliography: State Mineralogist Report XIX. U. S. Geol. Surv., Bulletins 322, 729. U. S. Bur. of Mines, Bull. 210, Eng. and Min. Jour.-Press, Vol. 118, No. 8, pp. 290-292, Aug. 23, 1924. Chem. & Met. Eng., Vol. 32, No. 6, Feb. 1925. Min. Congress Jour., Dec. 1924.

Two plants on a more or less experimental scale operated for six years in California, with commercial production beginning in a small way in 1922. The product, in part, was sold for utilization as a flotation oil in metallurgical work, and part consumed as fuel at the plants. No production has been reported since 1927.

Shale Oil Production of California, by Years

Year	Barrels	Value
1922		
1923	4,333	$44,262
1924		
1925*	8,688	55,240
1926		
1927*	8,819	9,998
1928		
Totals	21,840	$109,500

* Annual details concealed under 'Unapportioned.'

SILICA (Sand and Quartz)

Bibliography: State Mineralogist Reports IX, XIV, XV, XVII, XVIII, XX-XXVIII (inc.), XXXI-XXXII (inc.), XXXV-XLI (inc.). Bulletins 38, 67, 91.

The output of silica (quartz and glass sand) in California during 1945 amounted to a total of 581,725 net tons, valued at $1,309,564 f.o.b. rail shipping point, and was the largest annual yield so far reported in the state. The quartz came from a single property in San Bernardino County and the glass sand from a single property each in Contra Costa, Monterey, Riverside, and San Diego counties. The 1944 production totaled 274,291 tons, worth $830,311.

These materials were combined because of an overlapping in their uses and specifications as to the silicon dioxide (SiO_2) content. Vein quartz, ganister, and silica sand are used as refractories, in fire brick, in ceramic mixes and glazes, and as abrasives. It is possible to use quartz as well as glass sand in the manufacture of glass; also some of the quartz was used in the manufacture of ferrosilicon.

Not included under this heading are such forms of silica as sandstone, flint, tripoli, diatomaceous earth, and the gem forms of 'rock crystal,' amethyst, and opal. Each of these has various industrial uses, which are treated under their own designations.

Various deposits of quartz are found in California which could be utilized for glass making, but to date they have not been so used owing to the cost of grinding and the difficulty of preventing contamination by iron while grinding.

Silica sand has been produced in the following counties of the State: Alameda, Amador, Contra Costa, El Dorado, Imperial, Inyo, Los Angeles, Mariposa, Mono, Monterey, Orange, Placer, Riverside, San Bernardino, San Diego, San Joaquin and Tulare, the chief centers being Contra Costa, Monterey, Riverside and San Bernardino counties. The industry is of limited importance, so far, because of the fact that much of the available material is not of a grade which will produce first-class colorless glass; for such, it must be essentially iron-free. Even a fractional percent of iron imparts a green color to the glass.

Total Silica Production in California

Total silica production in California since the inception of the industry, in 1899, is shown below, being mainly sand:

Year	Tons	Value	Year	Tons	Value
1899	3,000	$3,500	1923	7,964	$30,420
1900	2,200	2,200	1924	6,808	35,006
1901	5,000	16,250	1925	12,498	96,780
1902	4,500	12,225	1926	30,010	104,317
1903	7,725	7,525	1927	24,636	94,762
1904	10,004	12,276	1928	14,814	66,679
1905	9,257	8,121	1929	18,686	79,210
1906	9,750	13,375	1930	17,802	71,380
1907	11,065	8,178	1931	43,330	182,769
1908	9,255	22,045	1932	33,997	136,324
1909	12,259	25,517	1933	70,329	266,520
1910	19,224	18,265	1934	70,432	296,643
1911	8,620	8,672	1935	70,835	297,272
1912	13,075	15,404	1936	77,830	310,278
1913	18,618	21,899	1937	84,313	348,987
1914	28,538	22,688	1938	63,167	278,676
1915	28,904	34,322	1939	86,229	349,074
1916	20,880	48,908	1940	101,041	376,723
1917	19,376	41,166	1941	137,660	514,266
1918	23,257	88,930	1942	193,174	692,762
1919	18,659	101,600	1943	161,318	533,434
1920	25,324	96,793	1944	274,291	830,311
1921	10,569	49,179	1945	581,725	1,309,564
1922	9,874	31,016			
			Totals	2,511,822	$8,002,211

SILLIMANITE-ANDALUSITE-KYANITE GROUP

Bibliography: State Mineralogist Reports XX, XXIII, XXIV, XXVII, XXXV-XXXIX (inc.). Bulletins 67, 91. Dana's Textbook of Mineralogy. U. S. Geol. Surv., Prof. Paper 110. U. S. Bureau of Mines, Inform. Circ. 6255. Eng. & Min. Jour.-Press. Vol. 120, pp. 91-94, 1925. Amer. Mineralogist, June, 1924.

During 1945 in California shipments of andalusite from Mono County and kyanite from Imperial County were made, the annual details being concealed under 'Unapportioned' item so as not to reveal the output of either operator. The 1945 output was a decrease in both amount and value as compared with that of 1944.

Sillimanite and andalusite are both aluminum silicates (Al_2SiO_5), having the same composition and formula, but with slightly different physical characteristics. Though both crystallize in the orthorhombric system, their crystal habits are different. A massive deposit of andalusite, found in Dry Creek Canyon in the White Mountains of the Inyo Range, in Mono County, is being mined by the Champion Spark Plug Company of Detroit, Michigan. The material is shipped East and utilized in the manufacture of porcelain for automobile spark plugs, for other high-tension electric insulators, laboratory ware and porcelain. Porcelain made from these minerals can be subjected to sudden and extreme changes in temperature without damage.

Kyanite is also an aluminum silicate (Al_2SiO_5), of the same chemical composition as andalusite and sillimanite, but crystallizing in the triclinic system. A deposit of kyanite is being mined in Imperial

County, near Ogilby, by the Vitrefrax Corporation and shipments made to their refractory plant in Los Angeles.

Dumortierite, though differing somewhat in composition from the above, being a basic aluminum silicate ($HAl_8BSi_3O_{20}$), has proved similar in behavior in ceramic work so that it is now being mixed with andalusite for electrical porcelains. A deposit of this mineral in Nevada is being mined for that purpose. Occurrences of massive dumortierite are known in Imperial and San Diego counties in this State and there may yet be some commercial possibilities for them.

Total Sillimanite Group Production of California, by Years

Year	Tons	Value	Year	Tons	Value
1922			1935		
1923 *	4,584	$98,790	1936 *	3,112	$89,214
1924			1937		
1925			1938 *	2,681	70,477
1926 *	4,810	203,000	1940		
1927			1941 *	1,344	23,391
1928 *	4,276	76,000	1942		
1929			1943 *	4,046	79,355
1930 *	4,359	198,893	1944		
1931			1945 *	2,390	38,713
1932 *	1,244	21,800			
1933					
1934 *	3,035	69,026	Totals	35,881	$968,659

* Annual details concealed under 'Unapportioned.'

SLATE

Bibliography: State Mineralogist Reports XV, XVIII, XXIV, XXVIII, XXXIV, XL. Bulletin 38. U. S. Geol. Surv., Bull. 586. U. S. Bur. of Mines, Bull. 218.

Slate was first produced in California in 1889. Up to and including 1910 such production was continuous, but since then it has been irregular. Large deposits of excellent quality are known in the State, especially in El Dorado, Calaveras, and Mariposa counties, but the demand has been light owing principally to competition of cheaper roofing materials.

As the 1945 production of slate in California came from a single property each in El Dorado and Placer counties, the annual details are concealed under the 'Unapportioned' items so as not to reveal the output of an individual. The material from El Dorado County was ground for roofing granules and the fines used as a filler; while that from Placer County was sold in thin flat pieces to be used as facing on the outside of buildings. The 1945 output showed a decrease in amount and value as compared with that of 1944.

The 1943-1944 output totaled 17,309 net tons valued at $102,851.

Total Production of Slate in California

A complete record of amount and value of slate produced in California follows:

Year	Squares	Value	Year	Squares	Value
1889	4,500	$18,089	1920	8	$80
1890	4,000	24,000	1921		
1891	4,000	24,000	1922	200	2,400
1892	3,500	21,000	1923		
1893	3,000	21,000	1926	(a)	7,371
1894	1,800	11,700	1927	[b]2,686	17,960
1895	1,350	9,450	1928	[b]4,075	31,263
1896	500	2,500	1929		
1897	400	2,800	1930	[b]8,220	71,347
1898	400	2,800	1931		
1899	810	5,900	1932	[b]8,234	55,182
1900	3,500	26,250	1933	[b]5,343	31,958
1901	5,100	38,250	1934	[b]5,065	24,245
1902	4,000	30,000	1935	(a)	40,912
1903	10,000	70,000	1936	(a)	49,818
1904	6,000	50,000	1937	(a)	32,572
1905	4,000	40,000	1938	[b]6,871	30,281
1906	10,000	100,000	1939	[b]8,777	28,327
1907	7,000	60,000	1940	[b]4,777	18,031
1908	6,000	60,000	1941		
1909	6,961	45,660	1942	[b]16,596	80,321
1910	1,000	8,000	1943	[b]17,309	102,851
1911			1944	*	*
1915	1,000	5,000	1945		
1916			Total value		$1,319,918

* Annual details concealed under 'Unapportioned.'
[a] Quantity not shown as both 'squares' and 'tons' included.
[b] Tons.

SOAPSTONE and TALC

Bibliography: State Mineralogist Reports XII, XIV, XV, XVII-XXVII (inc.), XXX, XXXIII-XXXIX (inc.), XLI. Bulletins 38, 67, 91. U. S. Bur. of Mines, Bulletin 213. Rep. of Investigations, Serial No. 2253, May, 1921.

The total production of talc, pyrophyllite, and soapstone in California during 1945 amounted to 65,202 net tons, valued at $922,682; compared with 64,041 tons, worth $824,052 in 1944. The 1945 output was the largest annual production ever reported in this state. The talc came from 4 properties each in Inyo and San Bernardino counties, the pyrophyllite from a single property each in Mono and San Diego counties, and the soapstone from a single property each in El Dorado and Tuolumne counties.

The talc and pyrophyllite mined during the year were used in toilet powder, cosmetics, paint, paper, rubber manufacture, as a carrier for insecticides, in delousing powder, in cotton finishing, in ceramics, steatite products, etc. The 'soapstone' grade was used as a carrier for insecticides, on asphalt roofing, and in paint.

Composition and Varieties

Talc is hydrous magnesium silicate with the chemical formula $H_2Mg_3(SiO_3)_4$. It is also called soapstone and steatite. The term 'talc' properly includes all forms of the pure mineral, whereas 'steatite' denotes particularly the massive, compact variety, and 'soapstone' the impure, massive forms containing as low as 50% of talc. When pure, talc is soft, having a hardness of 1, but impurities increase the hardness up to 3 or 4. The color varies from pure white and silvery white through gray, green, apple green, to dark green, also yellow, brown, and reddish when impure. It is commonly compact or massive, or in fine granular aggregates, and often in foliated plates or in fibrous aggregates.

Pyrophyllite is a hydrous aluminium silicate with the chemical formula $H_2Al_2Si_4O_{12}$. Its physical properties are similar to talc and it is often impossible to tell the two minerals apart. Pyrophyllite is slightly harder than talc.

Uses

Although the uses of talc and soapstone are many and varied, some of them are not in general well known nor fully developed; and although few of their uses can justly be considered essential in the sense that no substitute can be used, several are of great importance. The widest use of talc is in the powdered form, and the value depends upon color (whiteness), uniformity, fineness of grain, freedom from grit, 'slip,' and sometimes freedom from lime. The white varieties, free from grit and iron, low in lime, ground to 200-mesh and finer, are largely used as a filler for paper, rubber and paint, and the very highest grade as toilet powder. Ground talc is also used in dressing and coating cloth, in making soap, rope, twine, pipe-covering compounds, heavy lubricants, and polishes, and as a filler in concrete to make it waterproof. Ground talc and soapstone are used in ceramic body for tile and china; for foundry facings, either alone or mixed with graphite and a coarser grade is used in the manufacture of asphalt-coated roofing felts and papers, both as a filler and as a surfacing. Massive close-grained talc, free from iron and grit, is cut into blanks and baked, forming the material used for gas tips and electrical insulation, commonly known as 'lava.' Its hardness, its resistance to heat, acid and alkalies, and its great dielectric strength make it very useful for electric insulation, and no satisfactory substitute for it has been found.

Massive varieties of talc, pyrophyllite, and high grades of soapstone are cut into slate pencils and steel-workers' crayons. 'French chalk' or 'tailor's chalk' is a soft, massive talc. In China, Japan and India, massive talc (steatite) is carved into images and other forms, and is often sold as imitation jade. Soapstone is cut into slabs of 1 and 2 inches in thickness and sold as griddles, footwarmers, and fireless-cooker stones, or fabricated into laundry sinks and tubs, laboratory table tops, hoods, tanks and sinks, electric switchboards, and for other uses in which the properties of resistance to heat, acids and alkalies, and electricity are essential.

Talc Production of California, by Years

Production was intermittent in the State up to 1912; but there has been a material growth since 1916, as shown in the following table:

Year	Tons	Value	Year	Tons	Value
1893	400	$17,750	1920	11,327	$221,362
1894			1921	8,752	130,078
1895	25	375	1922	13,378	197,186
1896			1923	17,439	252,661
1897			1924	16,179	242,770
1898			1925	15,465	239,084
1899			1926	17,004	255,645
1900			1927	16,218	164,744
1901	10	119	1928	18,668	251,372
1902	14	288	1929	18,676	193,493
1903	219	10,124	1930	15,861	154,258
1904	228	2,315	1931	13,472	109,940
1905	300	3,000	1932	10,690	122,880
1906			1933	14,451	153,668
1907			1934	13,920	158,606
1908	3	48	1935	17,332	170,830
1909	33	280	1936	25,643	309,287
1910	740	7,260	1937	29,657	347,772
1911			1938	28,346	290,310
1912	1,750	7,350	1939	31,820	372,078
1913	1,350	6,150	1940	37,433	329,425
1914	1,000	4,500	1941	47,935	525,396
1915	1,663	14,750	1942	47,782	545,509
1916	1,703	9,831	1943	63,012	723,056
1917	5,267	45,279	1944	64,041	824,052
1918	11,760	85,534	1945	65,202	922,682
1919	8,764	115,091			
			Totals	714,932	$8,538,688

MISCELLANEOUS STONE

Bibliography: State Mineralogist Reports XII-XXVII (inc.), XXXI-XXXII, XXXV-XLI (inc.). Bulletin 38; also annual statistical bulletins from 1915 to date.

'Miscellaneous stone' is the name used throughout this report as the title for that branch of the mineral industry covering crushed rock of all kinds, paving blocks, sand and gravel, and pebbles for grinding mills. The foregoing are very closely related from the standpoint of the producer; therefore it has been found to be most satisfactory to group these items as has been done in recent reports of this Bureau. So far as it has been possible to do so, crushed rock production has been subdivided into the various uses to which the product was put. It will be noted, however, a very large percentage of the output has been tabulated under the heading 'Unclassified.' This is necessary because of the fact that many of the producers have no way of telling to what specific use their rock was put (or at least the proportions to each use) after they have quarried and sold the same to distributors and contractors.

In addition to amounts produced by commercial firms, both corporations and individuals, all of the counties use more or less gravel and broken rock on roads. Of much of this, particularly in the country districts, no definite record is kept.

As reported by producers during 1945, a total of 29,449,484 net tons of miscellaneous stone, including sand, gravel, crushed rock, rubble and rip rap, was produced in California valued at $20,207,351, as compared with 35,370,143 tons, worth $25,138,003 in 1944. Alameda

County led all counties in 1945 as to the value of miscellaneous stone with an output worth $4,643,264; Los Angeles County second with an output worth $4,183,004; and Sacramento County third with an output worth $1,177,108. All counties in the state contributed to the above totals for 1945 with the exceptions of Kings and Sutter.

Paving Blocks

During 1944 no production of paving blocks was reported in California. The 1943 output of paving blocks came from a single quarry in Sacramento County. The annual details are concealed under the 'Unapportioned' item so as not to reveal production of either operator.

The paving block industry has decreased materially of recent years, practically to the vanishing point, because of the increased construction of smoother pavements demanded by motor vehicle traffic. The blocks made in Solano County were of basalt; those from Sonoma were of basalt, andesite, and some trachyte, while those from Madera, Placer, Riverside, San Bernardino, and San Diego were of granite; and those from San Mateo County were of sandstone.

The amount and value of paving block production, annually, since 1887 has been as follows:

Year	Amount M	Value	Year	Amount M	Value
1887	*10,000	$350,000	1916	1,322	$54,362
1888	10,500	367,500	1917	938	38,567
1889	7,303	297,236	1918	372	17,000
1890	7,000	245,000	1919	27	1,350
1891	5,000	150,000	1920	63	3,155
1892	*3,000	96,000	1921	4	280
1893	2,770	96,950	1922	72	3,924
1894	2,517	66,981	1923	15	880
1895	2,332	73,338	1924	11	935
1896	4,161	77,584	1925	27	1,350
1897	1,711	35,235	1926		
1898	1,144	21,725	1927	41	2,057
1899	305	7,861	1928	25	1,658
1900	1,192	23,775	1929		
1901	1,920	41,075	1930		
1902	3,502	112,437	1931 [a]	66	5,900
1903	4,854	134,642	1932		
1904	3,977	161,752	1934	2	75
1905	3,408	134,347	1935		
1906	4,203	173,432	1938		
1907	4,604	199,347	1939 [a]	9	439
1908	7,660	334,780	1940		
1909	4,503	199,803	1941 [a]	155	30,862
1910	4,434	198,916	1942		
1911	4,141	210,819	1943 [a]	5	201
1912	11,018	578,355	1944		
1913	6,364	363,505			
1914	6,053	270,598	Totals	136,015	$5,712,288
1915	3,285	171,092			

* Figures for 1887-1892 (inclusive) are for Sonoma County only, as none are available for other counties during that period though Solano County quarries were then also quite active.

[a] Annual details concealed under 'Unapportioned.'

Grinding-Mill Pebbles

The 1945 output of grinding-mill pebbles in California came from a single property in San Diego County. The annual details are combined under the 'Unapportioned' item so as not to reveal the output of an individual. The 1945 production was an increase in amount and value as compared with that of 1944 which came from two properties in San Diego County and one in Calaveras County.

The amount and value of grinding-mill pebbles, annually, follows:

Year	Tons	Value	Year	Tons	Value
1915	340	$2,810	1931		
1916	20,232	107,567	1932 *	25	$211
1917	21,450	90,538	1933		
1918	8,628	61,268	1934 *	300	3,018
1919	2,607	19,272	1935		
1920	2,104	17,988	1936 *	961	8,356
1921	247	1,418	1937		
1922	1,571	7,628	1938 *	960	4,800
1923	2,650	14,936	1939		
1924	434	2,969	1940 *	482	982
1925	215	1,385	1941		
1926	102	612	1942 *	573	2,650
1927	288	1,800	1943		
1928	372	2,408	1944 *	162	1,367
1929			1945	*	*
1930 *	166	1,225	Totals	64,869	$355,208

* Annual details concealed under 'Unapportioned.'

Sand and Gravel

A considerable part of the gravel excavated is passed through grading and washing plants, and the material over 2 inches in size is crushed. Much of it is utilized in concrete mixtures. Most of the gravel used for road surfacing and repairs as well as that for railroad ballast is creek-run or pit-run material which is spread upon the roads without undergoing any grading or washing.

The 1945 sand and gravel output totaled 16,329,020 tons valued at $10,371,647, as compared with 21,318,163 tons worth $13,217,071 in 1944.

Included in the above for 1945 is a total of 44,447 net tons of molding sand valued at $155,567, which came from a single property each in Contra Costa, Orange, Riverside, Sacramento, San Diego, San Luis Obispo, San Mateo, Santa Barbara, and Ventura counties. The 1945 output showed a decrease from that of 1944, which totaled 97,444 tons worth $306,412.

The distribution of the 1945 output of sand and gravel by counties is as follows:

County	Tons	Value
Alameda	3,077,396	$1,953,746
Butte	28,602	20,926
Calaveras	*	*
Colusa	12,803	7,083
Contra Costa	[a]399,220	207,243
Del Norte	18,752	22,885
Fresno	451,275	299,869
Glenn	100,005	41,251
Humboldt	199,532	134,622
Imperial	156,290	68,429
Inyo	17,607	31,300
Kern	182,515	154,444
Lake	35,440	14,660
Lassen	3,060	1,860
Los Angeles	4,654,706	2,449,615
Mendocino	53,211	45,828
Merced	218,647	170,999
Modoc	5,585	4,737
Mono	6,005	6,658
Monterey	509,209	673,603
Nevada	*	*
Orange	[a]399,084	274,327
Placer	6,900	2,300
Plumas	56,100	18,900
Riverside	[a b c]429,868	280,323
Sacramento	[a]783,645	633,900
San Bernardino	1,051,523	431,328
San Diego	[a b c]475,858	404,565
San Joaquin	372,945	216,301
San Luis Obispo	[a]53,196	70,102
San Mateo	*	*
Santa Barbara	[a]44,306	23,365
Santa Clara	249,647	171,334
Shasta	77,475	43,775
Siskiyou	36,751	24,095
Sonoma	*	*
Stanislaus	166,135	112,932
Tehama	20,750	23,150
Tulare	200,703	159,400
Tuolumne	*	*
Ventura	[a]405,150	306,545
Yolo	192,776	116,432
Yuba	174,286	109,416
Alpine, Amador, Calaveras, El Dorado, Madera, Marin, Napa, Nevada, San Benito, San Mateo[a], Santa Cruz, Sierra, Sonoma, Trinity, Tuolumne*	1,002,062	639,399
Totals	16,329,020	$10,371,647

* Combined to conceal output of producers in each.
[a] Includes molding sand.
[b] Includes filter sand.
[c] Includes blast sand.

Crushed Rock

To list the kinds and varieties of rock utilized commercially under this heading would be to run almost the entire gamut of the classification scale. Much depends on the kind available in a given district. Those which give the most satisfactory service are the basalts and other hard, dense, igneous rocks which break with sharp, clean edges. In many localities, river-wash boulders form an important source of such material. In such cases, combined crushing and washing plants obtain varying amounts of sand and gravel along with the crushed sizes. In Sacramento and Butte counties the tailing piles from the gold dredges are the basis of like operations.

The values given are based on the selling price, f.o.b. cars, barges, or trucks, at the quarry. The 1945 output totaled 13,120,464 tons valued at $9,835,704, as compared with 14,051,980 tons, worth $11,920,932 in 1944. The accompanying table gives the breakdown of crushed rock by counties for 1945.

Crushed Rock Production by Counties for 1945

	Macadam and ballast		Rubble and Riprap		For concrete		Unclassified		Total	
	Tons	Value	Tons	Value	Tons	Value	Tons	Value	Tons	Value
Alameda	1,237,932	$1,208,489	*	*	*	*	2,151,560	$1,178,970	[d][e]3,389,492	$2,387,459
Butte	58,821	47,556			*	*	*	*	58,821	47,556
Calaveras							34,250	17,125	34,250	17,125
Humboldt	4,500	4,500	1,100	700					5,600	5,200
Inyo	2,145	4,962							2,145	4,962
Lassen	9,700	16,975							9,700	16,975
Los Angeles	*	*	*	*	*	*	[a]1,666,337	837,757	1,666,337	837,757
Mendocino							11,166	12,904	11,166	12,904
Merced							73,474	62,500	73,474	62,500
Modoc	[c]59,606	33,173			*	*	*	*	59,606	33,173
Mono	6,108	40,693							6,108	40,693
Nevada	6,792	8,490							6,792	8,490
Placer	23,687	29,608	*	*					23,687	29,608
Plumas	1,275	900							1,275	900
Sacramento	146,307	147,572	*	*			444,023	331,465	590,330	479,037
San Mateo	135,879	92,095	*	*	*	*	[c]212,278	157,367	348,157	249,462
Shasta	[a],[b]79,425	101,074							79,425	101,074
Contra Costa, El Dorado, Fresno[a], Los Angeles[a], Marin, Monterey, Napa, Orange[a], Riverside, San Bernardino, San Diego[a], Santa Barbara, Santa Clara, Siskiyou[c], Solano, Sonoma, Tuolumne, Yolo*	2,203,432	1,704,218							2,203,432	1,704,218
Alameda, Contra Costa, Del Norte, El Dorado, Los Angeles, Marin, Napa, Placer, Riverside, Sacramento, San Diego, San Mateo, Santa Cruz, Sonoma, Trinity, Yuba			1,606,452	1,585,961					1,606,452	1,585,961
Alameda, Butte, Contra Costa, Del Norte, El Dorado, Fresno, Los Angeles, Marin, Modoc, Monterey, Riverside, San Bernardino, San Diego, San Mateo, Ventura, Yuba*					517,876	459,110			517,876	459,110
Butte, Contra Costa, Fresno, Kern, Marin, Modoc, Orange, Riverside[a], San Benito, San Bernardino, San Diego[d], San Francisco, San Joaquin, Santa Clara, Siskiyou, Solano, Sonoma, Yuba*							2,426,339	1,751,540	2,426,339	1,751,540
Totals	3,975,609	$3,440,305	1,607,552	$1,586,661	517,876	$459,110	7,019,427	$4,349,628	13,120,464	$9,835,704

* Combined to conceal the output of operators in each.
[a] Includes decomposed granite.
[b] Includes slag.
[c] Includes volcanic cinders.
[d] Includes granules for roofing and terrazzo.
[e] Includes fill material.

Miscellaneous Stone Production of California, by Years

The amount and value, annually, of crushed rock (including macadam, ballast, rubble, riprap, and that for concrete), and sand and gravel, since 1893, follow:

Crushed Rock, Sand and Gravel, by Years

Year	Tons	Value	Year	Tons	Value
1893	371,000	$456,075	1920	9,792,122	$6,782,414
1894	661,900	664,838	1921	10,914,145	7,834,640
1895	1,254,688	1,095,939	1922	13,049,644	10,366,231
1896	960,619	839,884	1923	19,840,301	15,379,838
1897	821,123	600,112	1924	21,451,129	15,962,476
1898	1,177,365	814,477	1925	23,819,137	17,407,113
1899	964,898	786,892	1926	24,987,606	19,859,261
1900	789,287	561,642	1927	25,126,691	18,912,994
1901	530,396	641,037	1928	27,471,794	17,328,044
1902	2,056,015	1,249,529	1929	27,104,618	17,840,159
1903	2,215,625	1,673,591	1930	23,514,168	16,430,027
1904	2,296,898	1,641,877	1931	15,848,313	11,848,531
1905	2,624,257	1,716,770	1932	11,361,564	7,183,643
1906	1,555,372	1,418,406	1933	11,181,156	6,871,581
1907	2,288,888	1,915,015	1934	16,148,275	7,131,330
1908	3,998,945	3,241,774	1935	9,041,876	5,571,041
1909	5,531,561	2,708,326	1936	28,528,079	16,578,238
1910	5,827,828	2,777,690	1937	28,254,740	16,917,683
1911	6,487,223	3,610,357	1938	19,051,677	11,734,038
1912	8,044,937	4,532,598	1939	18,693,896	10,316,787
1913	9,817,616	4,823,056	1940	24,184,186	12,181,564
1914	9,288,397	3,960,973	1941	34,626,035	19,559,883
1915	10,879,497	4,609,278	1942	45,455,085	27,281,342
1916	9,951,089	4,009,590	1943	32,599,432	21,716,223
1917	8,069,271	3,505,662	1944	35,370,143	25,138,003
1918	6,641,144	3,325,889	1945	29,449,484	20,207,351
1919	6,919,188	3,678,322			
			Totals	698,890,323	$445,191,034

A comparison of the above table of annual production of these materials with the similar table for cement (see *ante*) reveals the fact that the important growth of the crushed rock and gravel business was coincident with the rapid development of the cement industry from the year 1902.

STRONTIUM

Bibliography: State Mineralogist Report XXVI, XXVII, XXXV-XXXVI, XXXVIII, XXXIX. Bulletins 67, 91. U. S. G. S. Bull. 540; 660-I.

During 1945 strontium minerals were mined and shipped from one property each in Imperial and San Bernardino counties. The annual details are concealed under the 'Unapportioned' item so as not to reveal the output of the individual. The 1943-1944 output totaled 2,500 short tons valued at $42,406. This material was reported to be used for pyrotechnics (red flares), in the refining of sugar, and in a new alloy of steel. The 1945 output showed a decrease in amount and value from that of 1944.

The first recorded commercial output of strontium minerals in California was in 1916. Shipments reported as averaging 80% $SrCO_3$ have been made, and both celestite ($SrSO_4$) the strontium sulphate and strontianite ($SrCO_3$) the strontium carbonate have been produced commercially in this state. The deposit is associated with deposits of barite

near Barstow, San Bernardino County. The carbonate has also been found in massive form near Shoshone, Inyo County. In addition to Imperial County, celestite is found near Calico and Ludlow, and in the Avawatz Mountains in San Bernardino County, but is as yet undeveloped.

The principal use for strontium in the United States is in the form of the nitrate in the manufacture of red flares, or Costen and Bengal lights and fireworks.

Production of strontium minerals in California, by years, has been as follows:

Year	Tons	Value	Year	Tons	Value
1916	57	$2,850	1941		
1917	3,050	37,000	1942 *	5,671	$83,069
1918	2,900	33,000	1943 *	2,500	42,406
1919			1944		
1939	2	82	1945	*	*
1940	627	8,686			
			Totals	14,807	$207,093

* Annual details concealed under 'Unapportioned.'

SULPHUR

Bibliography: State Mineralogist Reports IV, XIII, XIV, XXV, XXXIV, XXXV, XXXVIII. Bulletins 38, 67, 91.

During 1945 no sulphur was reported shipped from California properties. During the year the Leviathan Mine in Alpine County was taken over by a new company which expects to do much development and experimental work before going into production. This mineral has been found to some extent in Alpine, Colusa, Imperial, Inyo, Kern, Lake, Sonoma, Tehama, and Ventura counties.

Total Production of Sulphur in California

Sulphur was produced at the famous Sulphur Bank mine in Lake County, during the years 1865-1868 (inc.); following which the property became more valuable for its quicksilver. The Elgin quicksilver mine, near Wilbur Springs, Colusa County, is a similar occurrence.

Production of sulphur in California to date:

Year	Tons	Value	Year	Tons	Value
1865			1934	4,412	$67,656
1866 *	941	$53,500	1935		
1867			1936	5,308	61,603
1868 to 1922			1937		
1923			1938 *	9,451	120,010
1924 *	185	4,071	1939	4,811	73,741
1925 to 1928			1940	8,803	105,619
1929			1941	9,750	209,296
1930 *	265	9,025	1942	*	*
1931			1943		
1932					
1933 *	1,991	32,838	Totals	45,917	$737,359

* Annual details concealed under 'Unapportioned.'

ZIRCON

Bibliography: State Mineralogist Report XXXIV.

During 1944 no production of zircon was reported in California but in 1941 a small shipment of zircon sand was made from near Lincoln, Placer County, to the East Coast to be used in a steel alloy. In 1937 for the first time, zircon was reported in commercial quantities, in this State, from the Kaufield dragline dredge near Lincoln. They recovered considerable zircon from their black sand, but shipped only a small amount for experimental purposes in the manufacture of refractories and as an abrasive in blast sand.

The chief source of zirconium is the mineral zircon, a zirconium silicate, $ZrSiO_4$. Zircon is used as a gem, being next to the diamond in brilliancy; as a refractory, molds for steel, insulation in electric heating devices, as a coating on other refractories, coating of welding rods, and in the manufacture of other zirconium compounds.

The metal zirconium is used in radio tubes and as an alloy in steel, with copper, etc.

CHAPTER FIVE

SALINES

Bibliography: State Mineralogist Reports III, XIV, XV, XVII-XXIX (inc.), XXXIII-XL (inc.). Bulletin 24. Spurr and Wormser, "Marketing of Minerals." "Non-Metallic Minerals," by R. B. Ladoo. "Industrial Minerals and Rocks," A. I. M. E., 1937. See also under each substance.

Under this heading are included borax, common salt, soda, potash, and other alkaline salts. The first two have been produced in a number of localities in California, more or less regularly since the early sixties. Except for a single year's absence, soda has had a continuous production since 1894. Potash, magnesium chloride and sulphate, and calcium chloride have been added to the commercial list in recent years, joined in 1926 by bromine, and in 1931 by iodine and in 1938 by the alum minerals.

Our main resources of salines are the lake beds of the desert regions of Imperial, Inyo, Kern, Los Angeles, San Bernardino, and San Luis Obispo counties, and the waters of the Pacific Ocean.

The saline group showed a decrease in total value from $20,983,104 in 1944, to $18,918,432 in 1945. The 1944 total included the value of magnesia produced in 1942 and 1943 but not reported until 1944. Materials in this group showing an increased value over the previous year were borates, iodine, potash and soda; all others showed a decline.

The following tables gives details for each year:

Substance	1944		1945		Increase+ Decrease— Value
	Tons	Value	Tons	Value	
Borates	234,860	$5,264,864	257,299	$5,898,823	$633,959+
Magnesia and other magnesium compounds	113,927	4,537,381	*	*	* —
Salt	769,873	2,060,970	734,736	2,030,226	30,734—
Soda (soda ash and salt cake)	299,574	3,647,630	311,236	3,793,571	145,941+
Unapportioned	*	5,472,269		[b]7,195,812	1,723,543+
Total values		$20,983,104		$18,918,432	
Net decrease					$2,064,672—

[a] Includes bromine, calcium chloride, iodine, and potash.
[b] Includes bromine, calcium chlorine, iodine, magnesia and other magnesium compounds, and potash.

ALUM MINERALS

Bibliography: State Mineralogist Reports XXXV, XXXVII.

Several minerals found in California are considered natural alums. They are hydrous aluminum sulphates combined with sulphates of iron, potassium, sodium or magnesium. The most important are: Alunite, $K_2Al_6(OH)_{12}(SO_4)_4$, a basic hydrous aluminum and potassium sulphate, and Alunogen, $Al_2(SO_4)_3.16H_2O$, a hydrous aluminum sulphate.

In 1938 a small production was made and some development work was done on an alunogen deposit near Corona, Riverside County. This output was the first commercial production reported in California. The annual details are combined under 'Unapportioned' item to conceal the output of the single operator. An alunite deposit near Glen Ellen, Sonoma County, was opened up several years ago and some development work has been done in hope of commercializing this mineral.

BORATES

Bibliography: State Mineralogist Reports III, X, XII-XV (inc.), XVII-XXIII (inc.), XXV-XXVII (inc.), XXXIII-XXXIV, XXXVI, XXXVII, XXXIX. Bulletins 24, 67, 91.

During 1945, a total of 314,415 net tons of borate materials was produced in California, as compared with 276,398 tons for the preceding year. The material shipped during the year included the sodium borates, kernite (rasorite), kramerite from Kern County; also crystallized borax prepared by evaporation of brines at Searles Lake in San Bernardino County and Owens Lake in Inyo County, and a small amount of colemanite from Death Valley, Inyo County.

As the crude ore is not sold as much but is almost entirely refined into borax of commerce before shipping, and because of the fact that the material varied widely in boric acid content, we have recalculated the tonnage to a basis of 40 per cent B_2O_3. This is approximately the average B_2O_3 content of the crystallized borax obtained from evaporation of the lake brines.

Recalculated, the 1945 output totaled 257,299 net tons, valued at $5,898,823, as compared with 234,860 tons worth $5,264,864 for the year 1944. The above came from two properties each in Inyo and San Bernardino counties, and one in Kern County.

Total Production of Borate Materials in California

Borax was first discovered in California in the waters of Tuscan Springs in Tehama County, January 8, 1856. Borax Lake in Lake County was discovered in September of the same year by Dr. John A. Veach. This deposit was worked in 1864-1868, inclusive, and during that time produced 1,181,365 pounds of refined borax. The bulk of it was exported by sea to New York. This was the first commercial output of this salt in the United States, and California is still today the leading American producer of borax, having been for many years the sole producer. California is also the premier world source, today.

Production from the dry lake 'playa' deposits of Inyo and San Bernardino counties began in 1873; but it was not until 1887 that the borax industry was revoluntionized by the discovery of the colemanite beds at Calico, in San Bernardino County and later similar beds in Inyo and Los Angeles counties. The colemanite deposits of Ventura County were not worked extensively, owing to lack of transportation facilities. Some production of colemanite has been made from deposits opened up in Clarke County, Nevada. Colemanite was in turn, displaced by the discovery in 1926 of kernite (rasorite) a sodium borate and probertite (kramerite) a hydrous sodium, and calcium borate, near Kramer in Kern County. The brines of Searles Lake are likewise an important source.

The total production of borate materials in California is shown in the following table:

Total Production of Borate Materials in California

Year	Tons	Value	Year	Tons	Value
1864	12	$9,478	1906	58,173	$1,182,410
1865	126	94,099	1907	53,413	1,200,913
1866	201	132,538	1908	22,200	1,117,000
1867	220	156,137	1909	16,628	1,163,960
1868	32	22,384	1910	16,828	1,177,960
1869	----------	----------	1911	50,945	1,456,672
1870	----------	----------	1912	42,135	1,122,713
1871	----------	----------	1913	58,051	1,491,530
1872	140	89,600	1914	62,500	1,483,500
1873	515	255,440	1915	67,004	1,663,521
1874	915	259,427	1916	103,523	2,409,375
1875	1,168	289,080	1917	109,944	2,561,958
1876	1,437	312,537	1918	88,772	1,867,908
1877	993	193,705	1919	66,791	1,717,192
1878	373	66,257	1920	127,065	2,794,206
1879	364	65,443	1921	50,136	1,096,326
1880	609	149,245	1922	[2]39,087	1,068,025
1881	690	189,750	1923	62,667	1,893,798
1882	732	201,300	1924	52,070	1,699,149
1883	900	265,500	1925	46,124	1,526,938
1884	1,019	198,705	1926	47,605	1,625,298
1885	942	155,430	1927	72,462	3,043,260
1886	1,285	173,475	1928	109,722	3,378,552
1887	1,015	116,689	1929	144,678	3,312,085
1888	1,405	196,636	1930	209,869	3,686,817
1889	965	145,473	1931	206,405	5,753,037
1890	3,201	480,152	1932	179,356	2,856,470
1891	4,267	640,000	1933	197,495	3,019,513
1892	5,525	838,787	1934	240,696	5,524,262
1893	3,955	593,292	1935	280,249	4,602,064
1894	5,770	807,807	1936	313,389	5,911,093
1895	5,959	595,900	1937	326,099	6,206,619
1896	6,754	675,400	1938	276,144	5,014,237
1897	8,000	1,080,000	1939	244,819	5,110,807
1898	8,300	1,153,000	1940	212,358	5,254,154
1899	20,357	1,139,882	1941	224,986	4,745,872
1900	25,837	1,013,251	1942	203,716	4,929,553
1901	22,221	982,380	1943	216,687	4,953,174
1902	[1]17,202	2,234,994	1944	234,860	5,264,864
1903	34,430	661,400	1945	257,299	5,898,823
1904	45,647	698,810			
1905	46,334	1,019,158	Totals	5,672,787	$140,038,149

[1] Refined borax.
[2] Recalculated to 40% 'anhydrous boric acid' equivalent beginning with 1922.

BROMINE

Bibliography: State Mineralogist Report XXXVII.

The first commercial production of bromine and bromine compounds was begun during 1926 by the California Chemical Corporation in its plant at Chula Vista, San Diego County, from salt-works bittern-waters. This same plant has been recovering magnesium chloride for a number of years. Bromine is also now being made at a similar bittern-water plant at Newark, Alameda County, and beginning in 1940 from brines at Searles Lake, San Bernardino County. The 1945 output is a decrease in amount and value as compared with that of 1944. The 1944 yield was the largest annual production on record in California; annual details of which are concealed under the 'Unapportioned' item so as not to reveal the production of the single company which operated two of the three plants.

The total commercial production of bromine in California is as follows:

Year	Tons	Value	Year	Tons	Value
1926			1937		
1927 *	158	$120,480	1938 *	914	$327,823
1928			1939		
1929			1940	1,579	528,245
1930 *	802	552,933	1941		
1931			1942 *	2,206	741,790
1932			1943 *	2,762	1,024,549
1933 *	559	146,547	1944	*	*
1934			1945		
1935			Totals	9,785	$3,633,832
1936 *	805	191,465			

* Annual details concealed under 'Unapportioned.'

CALCIUM CHLORIDE

Bibliography: State Mineralogist Report XXXVII, XXXIX U. S. Geol. Surv. Min. Res. 1919, Pt. II. Engineering and Contracting, Roads and Streets, monthly issue, Feb. 6, 1924. 'How to Maintain Roads,' manual of instruction of Dow Chemical Company.

Calcium chloride is hygroscopic, that is, it has an affinity for water. This property makes the salt valuable as a drying agent.

During 1945 the production of calcium chloride in California came from a single property in San Bernardino County. The annual details are combined under the 'Unapportioned' item to conceal the output of the operator. The 1945 output showed a decrease in both the amount and value as compared with that of 1944.

Total Calcium Chloride Production in California

Commercial production of calcium chloride in California was first reported to the State Mining Bureau in 1921, from two plants in San Bernardino County, being obtained as a by-product in the refining of salt from deposits in certain of the desert dry lakes. Total production in California is shown in the following tabulation:

Year	Tons	Value	Year	Tons	Value
1921	683	$22,980	1934		
1922			1935 *	4,048	$16,196
1923 *	1,204	26,580	1936		
1924			1937 *	7,227	35,073
1925 *	10,988	328,876	1938		
1926			1939 *	7,279	40,182
1927 *	34,195	508,748	1940		
1928			1941 *	7,134	28,856
1929 *	12,020	114,080	1942		
1930			1943 *	14,448	61,027
1931 *	9,688	103,237	1944		
1932			1945 *	12,599	62,400
1933 *	3,103	15,500	Totals	124,616	$1,363,735

* Annual details concealed under 'Unapportioned.'

IODINE

Bibliography: State Mineralogist Reports XXXIV, XXXVI-XXXVII. U. S. Bureau of Mines I. C. 6387.

In 1945 the output of iodine in California came from two plants in Los Angeles County and showed an increase in both amount and value as compared with that of 1944. The annual details for 1943 and 1944 are combined to conceal the output of either operator. The 1943 production was the largest in amount and value so far reported in this State. The combined 1943-1944 output totaled 1,194,388 pounds valued at $1,532,700.

Total Iodine Production in California

Iodine was first produced in California during 1917 to 1921 as a by-product of potash, which was reduced from kelp in an experimental station of U. S. Department of Agriculture at Summerland, but after the armistice the demand for these minerals decreased so that the plant in Santa Barbara County closed. In 1929 the General Salt Company erected a plant which reduces iodine from the waste waters of certain deep oil wells in the Long Beach field. During 1933 two more plants started operation, making a total of three producing plants in the State.

Year	Pounds	Value
1929		
1931 *	696,297	$1,374,311
1933		
1934	355,279	423,016
1935		
1936 *	487,401	379,702
1937		
1938 *	624,318	508,119
1939		
1940 *	795,510	862,931
1941		
1942 *	979,733	1,207,613
1943 *	1,194,388	1,532,700
1944		
1945	*	*
Totals	5,132,926	$6,288,392

* Annual details concealed under 'Unapportioned.'

MAGNESIA and other MAGNESIUM COMPOUNDS

Bibliography: State Mineralogist Reports XX, XXI, XXV-XXVI (inc.), XXXIV, XXXVII, XXXIX, XL. Bulletin 91. 'Dictionary of Applied Chemistry,' by Thorpe. U. S. Geol. Surv., Min. Res. of P. S.

Magnesia and magnesium compounds produced in California during 1945 came from two properties in San Mateo County and one each in Alameda, Monterey, and San Diego counties. The annual details are concealed under the 'Unapportioned' item so as not to reveal the output of individual producers. The 1944 total was 113,927 net tons worth $4,537,381, but included some material produced prior to 1944 but not previously reported. The material from Alameda County was basic

magnesium carbonate and magnesium hydroxide; that from Monterey County was magnesia periclase; that from San Diego County was magnesium chloride; and that from San Mateo County was basic magnesium carbonate, magnesium carbonate, magnesium hydroxide, and magnesium oxide. The 1944 output was the largest annual production in both amount and value thus far reported in this State. The chloride was nearly all sold for use in magnesite stucco and cement mixtures (Sorel cement) also some for road liquor. The carbonate, or bulky white powder, was used as a heat-insulating material, as a substitute for magnesite, as a filler for rubber, paper, paint, etc., and in medicines, in tooth paste, in face powder and as a polish for metal and glass. The sulphate as in past years was utilized for medicinal and bath purposes. The material coming from San Diego County was residual bitterns from the salt plants and was in part marketed in the liquid form carrying from 35% to 67% $MgCl_2$ and in part as dry crystals, while that from Alameda and San Mateo counties was magnesium carbonate, magnesium hydroxide, and magnesium oxide, obtained by precipitation from sea water.

Magnesia plant of Permanente Metals Corporation at Moss Landing, Monterey County. Processes calcined dolomite from Natividad and sea water from Monterey Bay—*Photo by Walter W. Bradley.*

[2] U. S. Bureau of Mines, Monthly Cement Statement No. 296, Jan., 1946.
[3] Monthly Review of Mercantile Trust Co. of Calif., Vol. XIII, No. 3, p. 55, Mar., 1924.

Total Production of Magnesium Salts in California

Commercial production of magnesium chloride in California was begun in 1916 by some of the salt companies, from the residual bitterns obtained during the evaporation of sea water for its sodium chloride. In addition, some magnesium sulphate, or 'epsom salts' has also been made, but in smaller amount, and magnesium carbonate by a patented process direct from sea water.

The total production of magnesium salts in California, since the beginning of the industry here, is shown in the following tabulation:

Year	Tons	Value	Year	Tons	Value
1916	851	$6,407	1933	2,073	$159,660
1917	1,064	34,973	1934	2,325	194,642
1918	1,008	29,955	1935	2,785	235,531
1919	1,616	82,457	1936	3,798	347,838
1920	3,150	107,787	1937	3,867	316,669
1921	4,153	106,140	1938	24,176	469,636
1922	3,036	89,788	1939	3,895	382,457
1923	3,662	116,031	1940	4,325	419,666
1924	4,823	145,883	1941	6,352	654,372
1925	4,221	132,553	1942	6,260	642,680
1926	4,881	124,470	1943	9,026	728,065
1927			1944	113,927	4,537,381
1928 *	6,241	139,589	1945	*	*
1929					
1930 *	4,914	333,906	Totals	229,178	$10,756,465
1931					
1932 *	2,749	217,979			

* Annual details concealed under 'Unapportioned.'

POTASH

Bibliography: State Mineralogist Reports XV, XVIII, XX, XXII, XXV-XXXVII (inc.), XXXIV, XXXVII, XXXIX. Bulletins 24, 67, 91. U. S. G. S., Min. Res. 1913, 1914, 1915. Senate Doc. No. 190, 62 Congress, 2d Session. Mining & Sci. Press, Vol. 112, p. 155; Vol. 114, p. 789. Eng. & Min. Jour.-Press, Vol. 117, p. 557, April 5, 1924.

The 1945 production of potash in California came from a single operator in San Bernardino County, the details of which are concealed under the 'Unapportioned' item. This was principally chloride and some sulphate, with the product averaging 60% equivalent K_2O content. The material was sold mainly for fertilizer manufacture. The 1945 output showed an increase in amount and value over that of 1944.

Total Production of Potash in California

Potash production began commercially in California in 1914, with a small yield from kelp. Practically all of the output now comes from deposits of potash-bearing residues and brines in the old lake beds of the desert regions, particularly Searles Lake, in San Bernardino County. A small amount has been made from salt-works bitterns, and for a time some from Portland cement dust. Some also has been obtained from molasses distillery-slops char.

The annual amounts and values of these potash materials, since their beginning in California in 1914, have been as follows:

Year	Tons	Value	Year	Tons	Value
1914	10	$460	1932		
1915	1,076	19,391	1933		
1916	17,808	663,605	1934		
1917	129,022	4,202,889	1935	153,147	$3,932,721
1918	49,381	6,808,976	1936		
1919	28,118	2,415,963	1937	355,604	3,750,809
1920	26,298	1,465,463	1938		
1921	14,806	390,210	1939	358,417	6,988,922
1922	17,776	584,388	1940		
1923	29,597	709,836	1941	383,981	9,057,866
1924	33,107	747,407	1942		
1925	36,355	829,770	1943	310,023	6,058,274
1926	32,884	812,285	1944		
1927	67,340	1,952,852	1945	375,542	7,647,355
1928					
1929	178,680	5,522,350			
1930			Totals	392,213	8,345,318
1931	172,263	5,500,536			
				3,163,448	$78,407,646

* Annual details concealed under 'Unapportioned.'

SALT

Bibliography: State Mineralogist Reports II, XII-XV (inc.), XVII-XXIII (inc.), XXV-XXVII (inc.), XXXIV-XL (inc.). Bulletins 24, 67, 91. U. S. Geol. Survey, Bull. 669. U. S. Bur. of Mines, Bull. 146.

Most of the salt production in California is obtained by evaporation of water of the Pacific Ocean, plants being located on the shores of San Francisco, Monterey, and San Diego bays, and at Long Beach. Additional amounts are derived from lakes and lake beds in the desert regions (in part, rock salt), mainly in Imperial, Kern, and San Bernardino counties, and evaporation of alkaline lake water in Modoc County. A small amount of valuable medicinal salts has been obtained by evaporation of the water of Lake Mono, Mono County, and from a mineral spring in Butte County.

The 1945 salt production in California totaled 734,736 net tons, valued at $2,030,226, and came from three properties in Alameda County; two in San Bernardino County; and one each in Kern, Los Angeles, Monterey, Mono, Orange, and San Diego counties. The 1944 salt output was the largest annual yield every reported in this State and was 769,873 tons worth $2,060,960. The average value reported by salt producers in California in 1945 was $2.76 per ton, f.o.b. plant compared with $2.68 in 1944; $2,68 in 1943; $2.90 in 1942; $2.72 in 1941; $2.79 in 1940; $2.75 in 1939; and $2.78 in 1938.

Production of Salt in California, by Years

Although salt has been made in California since the early '60's, there are no definite or authenticated records for the earlier years before the beginning of the statistical tabulations by the State Mining Bureau.

Amount and value of annual production of salt in California from 1887 is shown in the following tabulation:

Year	Tons	Value	Year	Tons	Value
1887	28,000	$112,000	1917	227,825	$584,373
1888	30,800	92,400	1918	212,076	806,328
1889	21,000	63,000	1919	233,994	896,963
1890	8,729	57,085	1920	230,638	972,648
1891	20,094	90,303	1921	197,989	832,702
1892	23,570	104,788	1922	223,238	819,187
1893	50,500	213,000	1923	275,979	1,130,670
1894	49,131	140,087	1924	318,800	1,159,137
1895	53,031	150,576	1925	284,068	949,826
1896	64,743	153,244	1926	311,761	1,124,978
1897	67,851	157,520	1927	263,028	639,127
1898	93,421	170,855	1928	340,580	1,024,656
1899	82,654	149,588	1929	392,039	2,665,436
1900	89,338	204,754	1930	347,945	1,167,487
1901	126,218	366,376	1931	330,951	1,233,567
1902	115,208	205,876	1932	256,353	918,480
1903	102,895	211,365	1933	321,312	1,251,024
1904	95,968	187,300	1934	332,194	1,222,810
1905	77,118	141,925	1935	365,711	1,230,480
1906	101,650	213,228	1936	398,249	1,227,505
1907	88,063	310,967	1937	370,431	1,044,325
1908	121,764	281,469	1938	395,746	1,099,737
1909	155,680	414,708	1939	417,956	1,174,386
1910	174,920	395,417	1940	462,282	1,290,728
1911	173,332	324,255	1941	434,237	1,180,929
1912	185,721	383,370	1942	672,324	1,922,991
1913	204,407	462,631	1943	631,776	1,695,231
1914	223,806	583,553	1944	769,873	2,060,960
1915	169,028	368,737	1945	734,736	2,030,226
1916	186,148	455,695			
			Totals	13,738,879	$42,523,019

SODA

Bibliography: State Mineralogist Reports XII, XIII, XV, XVII, XVIII, XX, XXII, XXIII, XXV-XXIX (inc.), XXIV, XXXVI-XXXIX (inc.). Bulletins 24, 67, 91. U. S. Geol. Surv., Bull. 717.

The production of sodium salts in California in 1945 included soda ash, and trona, from plants at Owens Lake, Inyo County; and soda ash, salt cake, and trona (sesqui-carbonate, a double salt of Na_2CO_3 and $NaHCO_3$), from Searles Lake, San Bernardino County. The plant on Dale Lake near Amboy and Searles Lake, San Bernardino County, made shipments of salt cake. There were no shipments of salt cake (sulphate) from Carrizo Plains, San Luis Obispo County. Shipments made during the year 1945 totaled 311,236 net tons valued at $3,793,571 as compared with 299,574 tons worth $3,647,630 in 1944. The 1945 output had the largest amount and value of any annual production ever reported in this State. In 1945, 193,785 tons of soda ash and 117,451 tons of salt cake were reported shipped in California.

The soda ash was used mainly in the manufacture of soap, glass, paper, oil refining, sugar refining, chemicals, and water softener; and the trona for metallurgical purposes, as in the refining of copper, tungsten, and aluminum; in chemicals and water purification. The salt cake or sodium sulphate was used in the manufacture of paper, glass, and in chemicals.

Soda Production of California, by Years

The total output, showing amount and value of these materials in California since the inception of the statistical records of the State Mining Bureau, is given in the table which follows:

Year	Tons	Value	Year	Tons	Value
1894	1,530	$20,000	1921	14,828	$438,996
1895	1,900	47,500	1922	20,084	573,661
1896	3,000	65,000	1923	34,885	764,284
1897	5,000	110,000	1924	32,536	711,796
1898	7,000	154,000	1925	48,625	947,649
1899	10,000	250,000	1926	63,333	1,305,802
1900	1,000	50,000	1927	62,571	1,478,239
1901	8,000	400,000	1928	80,838	1,469,297
1902	7,000	50,000	1929	90,646	1,838,657
1903	18,000	27,000	1930	90,122	1,627,344
1904	12,000	18,000	1931	78,701	1,217,811
1905	15,000	22,500	1932	58,017	826,369
1906	12,000	18,000	1933	70,598	1,019,130
1907			1934	99,380	1,219,561
1908	9,600	14,400	1935	125,504	1,341,045
1909	7,712	11,593	1936	144,314	1,412,788
1910	8,125	11,862	1937	153,685	1,461,057
1911	9,023	52,887	1938	178,105	2,023,610
1912	7,200	37,094	1939	200,049	2,055,608
1913	1,861	24,936	1940	228,108	2,339,639
1914	6,522	115,396	1941	179,210	2,028,718
1915	5,799	83,485	1942	267,723	3,125,078
1916	10,593	264,825	1943	260,590	3,166,576
1917	24,505	928,578	1944	299,574	3,647,630
1918	20,447	855,423	1945	311,236	3,793,571
1919	21,294	721,958			
1920	32,407	1,164,898	Totals	3,459,780	$47,353,251

CHAPTER SIX

BY COUNTIES

Introductory

The State of California includes a total area of 158,297 square miles, of which 156,803 square miles are of land (according to 1940 census resurvey). The maximum width is 235 miles, the minimum 148 miles, and the length from the northwest corner to the southeast corner is 775 miles. The State is divided into 58 counties. The 1940 census figures show a total population for California of 6,907,387. Minerals of commercial value exist in every county, and during 1945 some active production was reported to the State Division of Mines from all of the 58.

Rank of Counties in Mineral Yield, 1945

Of the 10 leading counties in point of total values of mineral output during 1945, the first five, Kern, Los Angeles, Fresno, Orange, and Ventura; and Santa Barbara, seventh, and Kings, eighth, owe their position to petroleum and natural gas; Sacramento, ninth, to natural gas, gold and miscellaneous stone. Kern County, which led all other counties in 1945 and is credited with 27 percent of the State's value of mineral production, passed Los Angeles County in 1944. Both counties owe their position to crude oil. San Bernardino County, sixth, owes its position to cement, borates, potash, and soda; and Alameda County, tenth, to miscellaneous stone and salt.

Twenty-six counties had a mineral production with a value in excess of a million dollars in 1945. The value of natural gas exceeded the million dollar mark in eight counties; cement and petroleum in seven counties each; miscellaneous stone and gold in three counties each; borates in two counties; and brick, diatomite, lead, potash, quicksilver, salt, soda, and tungsten ore in one county each.

In point of variety and diversity San Bernardino County led all others in 1945 with 29 different mineral substances on its commercial list; followed in turn by Kern County with 18; Inyo County with 15, Fresno, Los Angeles, Riverside, and Shasta counties each with 12; Orange and San Diego Counties each with 11; and Alameda, Calaveras, El Dorado, Mono, Placer, Santa Clara, and Siskiyou counties each with 10.

Counties in Order of Value of Mineral Output for 1945

	County	*Value*		*County*	*Value*
1.	Kern	$126,716,070	31.	San Luis Obispo	497,923
2.	Los Angeles	103,641,827	32.	Marin	491,435
3.	Fresno	51,677,246	33.	Amador	487,544
4.	Orange	35,178,471	34.	Yolo	479,810
5.	Ventura	29,352,740	35.	Tuolumne	434,626
6.	San Bernardino	23,038,011	36.	Stanislaus	406,727
7.	Santa Barbara	22,643,580	37.	Imperial	383,431
8.	Kings	13,568,174	38.	Del Norte	341,306
9.	Sacramento	9,240,880	39.	El Dorado	301,627
10.	Alameda	6,661,939	40.	Merced	285,363
11.	Santa Clara	5,810,388	41.	Tulare	256,764
12.	Solano	5,282,725	42.	Placer	241,359
13.	Riverside	4,644,406	43.	Humboldt	201,514
14.	Inyo	4,258,250	44.	Lake	197,448
15.	Monterey	3,018,280	45.	Modoc	193,156
16.	Calaveras	2,789,881	46.	Madera	189,886
17.	Contra Costa	2,496,533	47.	Sierra	172,782
18.	San Mateo	2,363,508	48.	Mendocino	118,767
19.	Shasta	2,119,802	49.	Mono	91,928
20.	Santa Cruz	2,015,407	50.	Trinity	91,560
21.	San Benito	1,949,386	51.	San Francisco	75,172
22.	San Joaquin	1,256,594	52.	Glenn	72,046
23.	Nevada	1,196,433	53.	Tehama	69,921
24.	Yuba	1,186,139	54.	Sutter	62,910
25.	Mariposa	1,171,094	55.	Plumas	41,243
26.	San Diego	1,142,350	56.	Lassen	20,635
27.	Siskiyou	926,305	57.	Colusa	7,083
28.	Sonoma	807,122	58.	Alpine	1,500
29.	Butte	663,610			
30.	Napa	628,974			$473,661,591

ALAMEDA

Land area: 733 square miles.
Population: 513,011 (1940 census).
Location: East side of San Francisco Bay.
County seat: Oakland.
References: State Mineralogist Report XVII:XVIII:XX:XXVI (Oct., 1929):XXXV:XXXIX.

Alameda, while in no sense one of the "mining counties," came tenth on the list of counties as to value, with a mineral production for 1945 worth $6,661,939 and had 10 different substances. This was a decrease from the 1944 output which was valued at $8,089,026.

Commercial production for 1945 was as follows:

Substance	*Amount*	*Value*
Clay (pottery)	8,269 tons	$7,519
Stone, miscellaneous	----	4,643,264
Unapportioned *	----	2,011,156
Total value		$6,661,939

* Includes brick and hollow tile, bromine, gypsum (by-product not included in value), limestone (shells), magnesia, manganese ore, salt.

ALPINE

Land area: 723 square miles.
Population: 323 (1940 census).
Location: On eastern border of State, south of Lake Tahoe.
County seat: Markleeville.
References: State Mineralogist Report XV:XVII:XVIII:XXVII (Oct., 1931):XXV:XXXVII.

Alpine County ranked fifty-eighth in value of output for 1945 which was $1,500, compared with $2,214 in 1914. The 1945 production was miscellaneous stone.

AMADOR

Land area: 594 square miles.
Population: 8,973 (1940 census).
Location: East-central part of State—Mother Lode District.
County seat: Jackson.
References: State Mineralogist Report XV:XVII:XVIII:XIX:XX:XXII (April, 1927):XXX:XXXV:XXXVII, XXXIX.

Amador County ranked thirty-third as to value of mineral output for 1945 with eight different substances worth $487,544, compared with $283,206 in 1944.

Amador at one time led the State in gold production, though exceeded in 1920-1923 and in 1926-1927 by Yuba and Nevada counties; in 1925 and 1928 by Yuba only, 1929-1932 by Nevada only, and in 1931-1936 and 1939-1941 by Nevada and Sacramento, and ranked only sixth in 1945.

Commercial production for 1945 was as follows:

Substance	*Amount*	*Value*
Copper	1,619,793 lbs.	$ 218,672
Gold	476 fine ozs.	16,660
Silver	12,517 fine ozs.	8,901
Unapportioned *		243,311
Total value		$487,544

* Includes brick, clay (pottery), lead, limestone, miscellaneous stone.

BUTTE

Land area: 1,665 square miles.
Population: 42,840 (1940 census).
Location: North-central portion of State.
County seat: Oroville.
References: State Mineralogist Report XV:XVII:XVIII:XXIV:XVI (Oct., 1930):XXXI:XXXIX.

Butte County ranked twenty-ninth in regard to value of mineral output in 1945 with eight different substances, having a total value of $663,610 compared with $929,239 in 1944.

Commercial production for 1945 was as follows:

Substance	*Amount*	*Value*
Copper	404,572 lbs.	$54,617
Gold	4,880 fine ozs.	170,800
Lead	45,321 lbs.	3,898
Silver	19,107 fine ozs.	13,587
Stone, miscellaneous	----	122,965
Zinc	2,586,024 lbs.	297,393
Other minerals	----	350
Total value		$663,610

CALAVERAS

Land area: 1028 square miles.
Population: 8,221 (1940 census).
Location: East-central portion of State—Mother Lode District.
County seat: San Andreas.
References: State Mineralogist Report XIV:XVII:XVIII:XIX:XX:XXI:XXXII (July, 1936):XXXV:XXXVII:XXXIX:XL.

Calaveras County ranked sixteenth in California in regard to value of mineral output in 1945, with a total of $2,789,881, as compared with $2,642,638 in 1944.

Commercial production for 1945 consisted of ten different substances, and was as follows:

Substance	Amount	Value
Copper	3,543,910 lbs.	$478,428
Gold	2,482 fine ozs.	86,870
Lead	50,253 lbs.	4,322
Silver	65,245 fine ozs.	46,411
Stone, miscellaneous	----	31,982
Zinc	4,633,253 lbs.	532,824
Unapportioned *	----	1,609,044
Total value		$2,789,881

* Includes cement, clay (pottery), mineral water.

COLUSA

Land area: 1153 square miles.
Population: 9,788 (1940 census).
Location: Sacramento Valley.
County seat: Colusa.
References: State Mineralogist Report XIV:XVII:XVIII:XXV (April, 1929):XXXV:XXXIX.

Colusa County ranked fifty-seventh in regard to value of mineral output in 1945, worth a total of $7,083, as compared with $14,491 in 1944. Commercial production for 1945 consisted of miscellaneous stone.

CONTRA COSTA

Land area: 734 square miles.
Population: 100,450 (1940 census).
Location: East side of San Francisco Bay.
County seat: Martinez.
References: State Mineralogist Report XVII:XVIII:XXIII (Jan., 1927):XXXV.

Contra Costa County stands seventeenth on the list in respect to value of mineral output for 1945, with nine different substances worth $2,496,533 as compared with $3,244,179 in 1944.

Commercial production for 1945 was as follows:

Substance	Value
Stone, miscellaneous	$687,560
Unapportioned *	1,808,972
Total value	$2,496,533

* Includes brick and hollow tile, cement, mineral water, natural gas, pumice, quicksilver, silica (glass sand).

DEL NORTE

Land area: 1003 square miles.
Population: 4,745 (1940 census).
Location: Extreme northwest corner of State.
County seat: Crescent City.
References: State Mineralogist Report XIV : XVII : XXI (July, 1925):XXIX (Jan.-April, 1933):XXXIV:XXXV:XXXVII: XXXIX.

Del Norte County was in thirty-eighth place as to mineral production for 1945 with four different substances worth $341,306, as compared with $509,703 in 1944.

Commercial production in 1945 was as follows:

Substance	*Value*
Stone, miscellaneous	$23,685
Unapportioned *	317,621
Total value	$341,306

* Includes Chromite, quicksilver.

EL DORADO

Land area: 1725 square miles.
Population: 13,229 (1940 census).
Location: East-central portion of the State, northernmost of the Mother Lode counties.
County seat: Placerville.
References: State Mineralogist Report XV:XVII:XVIII:XIX:XX:XXII (Oct., 1926):XXXI:XXXIV (July, 1938):XXXV:XXXVIII:XXXIX.

El Dorado, which contains the location where gold in California was first heralded to the world, comes thirty-ninth on the list of counties ranked according to value for 1945, with ten different mineral substances worth $301,627. The 1944 output was valued at $298,859.

Commercial production for 1945 was as follows:

Substance	*Amount*	*Value*
Copper	45,284 lbs.	$6,113
Gold	676 fine ozs.	23,660
Silver	1,112 fine ozs.	791
Unapportioned *	----	271,063
Total value		$301,627

* Includes chromite, lead, limestone, slate, soapstone, miscellaneous stone.

FRESNO

Land area: 5985 square miles.
Population: 178,565 (1940 census).
Location: South-central portion of State.
County seat: Fresno.
References: State Mineralogist Report XIV:XVII:XVIII:XXV (July, 1929):XXXV:XXXVII:XXXIX:XLI.

Fresno County, third in importance as a mineral producer among the counties of California, reports an output for 1945 of twelve different mineral substances, with a total value of $51,677,246, as compared with the 1944 value of $49,800,782.

Commercial production for 1945 was as follows:

Substance	*Amount*	*Value*
Gold	117 fine ozs.	$4,095
Natural gas	46,897,552 M cu. ft.	2,832,579
Petroleum	44,370,645 bbls.	47,822,774
Silver	17 fine ozs.	12
Stone, miscellaneous	----	735,588
Unapportioned *	----	282,198
Total value		$51,677,246

* Includes brick and hollow tile, chromite, clay (pottery), granite, quicksilver, tungsten ore.

GLENN

Land area: 1317 square miles.
Population: 12,195 (1940 census).
Location: West side of Sacramento Valley.
County seat: Willows.
References: State Mineralogist Report XIV:XVII:XVIII:XXXV: XXXVII. XXXIX.

Glenn County stands fifty-second as a mineral producing county of the State for 1945, and owes its position to the presence of large deposits of sand and gravel (much of which is used as railroad ballast), chromite, and natural gas.

Commercial production for 1945 totaled $72,046, compared with the 1944 output worth $33,736.

Substance	*Value*
Stone, miscellaneous	$41,251
Unapportioned *	30,795
Total value	$72,046

* Includes natural gas, other minerals.

HUMBOLDT

Land Area: 3573 square miles.
Population: 45,812 (1940 census).
Location: Northwestern portion of State, bordering on Pacific Ocean.
County seat: Eureka.
References: State Mineralogist Report XIV:XVII:XVIII:XXI (July, 1925):XXXV:XXXVII (Oct., 1941). XXXIX.

Humboldt County ranked forty-third in the value of its mineral output among the counties of the State for 1945 with seven different mineral substances valued at $201,514, compared with the 1944 output worth $373,525.

Commercial production for 1945 was as follows:

Substance	*Amount*	*Value*
Gold	51 fine ozs.	$1,785
Silver	7 fine ozs.	5
Stone, miscellaneous		139,822
Unapportioned *		59,902
Total value		$201,514

* Includes chromite, manganese ore, natural gas.

IMPERIAL

Land area: 4284 square miles.
Population: 59,740 (1940 census).
Location: Extreme southeast corner of the State.
County seat: El Centro.
References: State Mineralogist Report XIV:XVII:XVIII:XIX: XX:XXII (April, 1926):XXXIV-XXXVI (inc.), XXXVIII (April, 1942).

Imperial County ranks thirty-seventh in total value of mineral output for 1945 with eight different mineral substances worth $383,431, compared with $564,263 for 1944.

Commercial production for 1945 was as follows:

Substance	*Value*
Stone, miscellaneous	$68,429
Unapportioned *	315,002
Total value	$383,431

* Includes carbon dioxide, gems, gypsum, manganese ore, mica, kyanite, strontium.

INYO

Land area: 10,091 square miles
Population: 7625 (1940 census).
Location: Lies on eastern border of State, north of San Bernardino County.
County seat: Independence.
References: State Mineralogist Report XV : XVII : XVIII : XX : XXII (Oct., 1926) : XXVII : XXX : XXXIII : XXXIV (Oct., 1938) : XXXV-XXXVII (inc.). XXXIX, XLI.

Inyo County's mineral output for 1945 reached a total value of $4,258,250, having fifteen different mineral substances and standing fourteenth among the counties of the State as to value of production. The 1944 yield was worth $6,716,413.

Commercial production for 1945 was as follows:

Substance	*Amount*	*Value*
Copper	200,004 lbs.	$27,001
Gold	1,844 fine ozs.	64,540
Lead	13,214,935 lbs.	1,136,484
Silver	637,881 fine ozs.	453,604
Stone, miscellaneous	----	36,262
Talc	28,991 tons	457,447
Zinc	1,297,975 lbs.	149,267
Unapportioned *	----	1,933,645
Total value		$4,258,250

* Includes bentonite, borates, abrasive garnets, limestone, pumice, soda, tungsten ore.

KERN

Land area: 8170 square miles.
Population: 135,124 (1940 census).
Location: South-central portion of State.
County seat: Bakersfield.
References: State Mineralogist Report XIV : XVII : XVIII : XIX : XX : XXV (Jan., 1929) : XXIX (July-Oct., 1933) : XXX : XXXIV : XXXIX (inc.).

Kern County, because of its immensely productive oil fields, stands preeminent among all counties of California in the value of its mineral output. It was surpassed by Los Angeles and Orange counties in 1923, but by Los Angeles only in 1924-1943, for which petroleum is responsible. The 1945 production consisted of eighteen different mineral substances valued at $126,716,070, compared with the 1944 output worth $108,257,342.

Commercial production for 1945 was as follows:

Substance	Amount	Value
Clay (pottery and oil well drilling)	168,925 tons	$711,676
Gold	914 fine ozs.	31,990
Natural gas	76,648,176 M. cu. ft.	3,972,990
Petroleum	110,290,276 bbls.	116,846,281
Silver	543 fine ozs.	386
Stone, miscellaneous	----	156,507
Zinc	11,897 lbs.	1,368
Unapportioned *	----	4,994,872
Total value		$126,716,079

* Includes borates, cement, copper, gypsum, lead, volcanic ash, salt, tungsten ore.

KINGS

Land area: 1395 square miles.
Population: 35,168 (1940 census).
Location: South-central portion of the State.
County seat: Hanford.
References: State Mineralogist Report IX:XVII:XVIII:XXVI (Oct., 1930):XXXV.

Kings County, previous to the discovery of Kettleman Hill oil fields in 1928, had little or no mineral output, but in 1929 it ranked seventh in total value of annual mineral production, seventh in 1930, 1938 and 1941-42; third in 1931; eighth in 1936-1937, and 1943-1945; sixth in 1939.

Commercial production for 1945 was as follows:

Substance	Amount	Value
Natural gas	53,291,804 M cu. ft.	$3,010,740
Petroleum	8,375,249 bbls.	10,556,594
Other minerals	----	840
Total value		$13,568,174

LAKE

Land area: 1256 square miles.
Population: 8,069 (1940 census).
Location: About fifty miles north of San Francisco Bay and the same distance inland from the Pacific Ocean.
County seat: Lakeport.
References: State Mineralogist Report XIV:XVII:XVIII:XX:XXV (July, 1929):XXXIV:XXXV, XXXIX, XLI.

Lake County was in forty-fourth place as to the value of mineral output for 1945, worth $197,448, compared with $468,389 in 1944.

Commercial production for 1945 was as follows:

Substance	Amount	Value
Mineral water	8,700 gals.	$2,012
Stone, miscellaneous	----	14,660
Other minerals	----	180,776
Total value		$197,448

LASSEN

Land area: 4548 square miles.
Population: 14,479 (1940 census).
Location: Northeast portion of State.
County seat: Susanville.
References: State Mineralogist Report XV:XVII:XVIII:XIX:XXV (Jan., 1929):XXX:XXXII (Oct., 1936), XXXIX.

Lassen County was in fifty-sixth place as a mineral producer for 1945, with an output of $20,635, compared with $26,495 which was the value for the previous year.

Commercial production for 1945 was as follows:

Substance	*Value*
Stone, miscellaneous	$18,835
Other minerals	1,800
Total value	$20,635

LOS ANGELES

Land area: 4071 square miles.
Population: 2,785,643 (1940 census).
Location: One of the southwestern coast counties.
County seat: Los Angeles.
References: State Mineralogist Report XV:XVII:XVIII:XIX:XX:XXIII (July, 1927):XXX:XXXIII (July, 1937):XXXIV-XXXVI.

The mineral production of Los Angeles County for the year 1945 amounted in value to $103,641,827, as compared with the 1944 total worth of $108,138,154. Los Angeles led the counties of the State in total value of mineral output from 1923 to 1943, inclusive, but was passed by Kern in 1944-1945.

Commercial production for 1945 consisted of twelve substances and was as follows:

Substance	*Amount*	*Value*
Brick and hollow building tile	----	$1,664,186
Clay (pottery)	54,307 tons	60,518
Gold	87 fine ozs.	3,045
Mineral water	11,643,290 gals.	423,378
Natural gas	92,482,309 M cu. ft.	6,514,113
Petroleum	85,192,691 bbls.	89,404,673
Silver	422 fine ozs.	300
Stone, miscellaneous	----	4,193,004
Unapportioned *	----	1,388,610
Total value		$103,641,827

* Includes diatomite, iodine, salt.

MADERA

Land area: 2148 square miles.
Population: 23,314 (1940 census).
Location: East-central portion of State.
County seat: Madera.
References: State Mineralogist Report XIV:XVII:XVIII:XXIV (Oct., 1928) :XXX :XXXI :XXXIV :XXXVII :XXXVIII :XXXIX

Madera County was in forty-sixth place as a mineral producer for 1945, with an output of seven different mineral substances valued at $189,886, compared with $74,141 for 1944.

Commercial production for 1945 was as follows:

Substance	*Amount*	*Value*
Copper	22,957 lbs.	$3,099
Gold	1 fine oz.	35
Silver	83 fine ozs.	59
Unapportioned *	----	186,693
Total value		$189,886

* Includes natural gas, pumice and volcanic ash, miscellaneous stone.

MARIN

Land area: 521 square miles.
Population: 52,907 (1940 census).
Location: Adjoins San Francisco on the north.
County seat: San Rafael.
References: State Mineralogist Report XIV:XVII:XVIII:XXII (July, 1926):XXIX:XXXV.

Marin County had thirty-second place as to the value of mineral output for 1945, with five different mineral substances. The total was $491,435, as compared with $312,849 in 1944.

Commercial production included clay (pottery), mineral water, manganese ore, crushed rock, sand and gravel.

MARIPOSA

Land area: 1455 square miles.
Population: 5,605 (1940 census).
Location: Most southerly of the Mother Lode counties. East central portion of State.
County seat: Mariposa.
References: State Mineralogist Report XIV:XVII:XVIII:XXIV (April, 1928):XXXI (Jan., 1935):XXXV:XXXVII.

Mariposa County is one of the distinctly *mining* counties of the State, although it stands but twenty-fifth on the list of counties in regard to the value of its mineral output for 1945, with a total of $1,171,094, as compared with $1,306,411 for 1944. Mariposa County has been the source of a large tonnage of limestone, which was credited to cement manufacture in Merced County.

Commercial production with seven different mineral substances for 1945 was as follows:

Substance	*Amount*	*Value*
Copper	179,848 lbs.	$24,280
Gold	3,270 fine ozs.	114,450
Lead	236,315 lbs.	20,323
Silver	96,525 fine ozs.	68,639
Zinc	6,621,322 lbs.	761,452
Unapportioned *		181,950
Total value		$1,171,094

* Includes barite, miscellaneous stone.

MENDOCINO

Land area: 3510 square miles.
Population: 27,864 (1940 census).
Location: Joins Humboldt County on the south and bounded by the Pacific Ocean on the west.
County seat: Ukiah.
References: State Mineralogist Report XIV:XVII:XVIII:XIX:XX:XXXV:XXXIX.

Mendocino County's mineral output for 1945 was valued at $118,767 which gave it rank of forty-eighth among the counties of the State as a mineral producer. The 1944 production was valued at $152,039.

Commercial production for 1945 was as follows:

Substance	Value
Stone, miscellaneous	$58,732
Unapportioned *	60,035
Total value	$118,767

*Includes carbon dioxide, natural gas.

MERCED

Land area: 1983 square miles.
Population: 46,988 (1940 census).
Location: About the geographical center of the State.
County seat: Merced.
References: State Mineralogist Report XIV:XVII:XVIII:XXI (April, 1925):XXXI (Jan., 1935):XXXV.

Merced County ranked fortieth as to the value of mineral output for 1945, with four different mineral substances worth $285,363 compared with $853,905 for 1944.

Commercial production for 1945 was as follows:

Substance	Amount	Value
Gold	1,479 fine ozs.	$51,765
Silver	139 fine ozs.	99
Stone, miscellaneous	----	233,499
Total value		$285,363

MODOC

Land area: 4094 square miles.
Population: 8,713 (1940 census).
Location: The extreme northeast corner of the State.
County seat: Alturas.
References: State Mineralogist Report XV:XVII:XVIII:XXV (Jan., 1929):XXX:XXXII (Oct., 1936):XXXV.

Modoc County in forty-fifth place for 1945 reported a commercial production as follows:

Substance	Amount	Value
Stone, miscellaneous	----	$42,551
Gold	10 fine ozs.	350
Silver	7 fine ozs.	5
Other minerals	----	150,250
Total value		$193,156

MONO

Land area: 3045 square miles.
Population: 2,299 (1940 census).
Location: Is bordered by the State of Nevada on the east and is about in the central portion of the State measured on a north and south line.
County seat: Bridgeport.
References: State Mineralogist Report XV:XVII:XVIII:XX:XXIII (Oct., 1927):XXX:XXXIV:XXXV:XXXVI (April, 1940):XXXVII:XXXVIII:XXXIX.

Mono County is forty-ninth with 10 different mineral substances, and reported a commercial production for 1945 as follows:

Substance	Amount	Value
Lead	14,712 lbs.	$1,265
Stone, miscellaneous	----	47,351
Zinc	6,445 lbs.	741
Unapportioned *	----	42,571
Total value		$91,928

* Includes copper, pumice, salt, andalusite, talc, pyrophyllite, tungsten ore.

MONTEREY

Land area: 3324 square miles.
Population: 73,032 (1940 census).
Location: West-central portion of State, bordering on Pacific Ocean.
County seat: Salinas.
References: State Mineralogist Report XV:XVII:XVIII:XIX: XXI (Jan., 1925):XXXI:XXXIV:XXXV:XL.

Monterey County produced eight different mineral substances during 1945, having a total value of $3,018,280, as compared with $4,942,121 for 1944. In the 1944 total of the county is included the value of magnesia, produced prior to 1944, but not previously reported.

In fifteenth place, commercial production for 1945 was as follows:

Substance	Value
Stone, miscellaneous	$691,303
Unapportioned *	2,326,977
Total value	$3,018,280

* Includes dolomite, gypsum, magnesia, salt, sandstone, silica (glass sand).

NAPA

Land area: 790 square miles.
Population: 28,503 (1940 census).
Location: Directly north of San Francisco Bay—one of the 'bay counties.'
County seat: Napa.
References: State Mineralogist Report XIV:XVII:XVIII:XX: XXV (April, 1929):XXXV:XXXIX:XLI.

In 1945 the value of Napa County's mineral output was $628,974 (placing it in thirtieth place on the list of counties), as compared with $709,686 for 1944.

With seven different mineral substances, commercial production for 1945 included asbestos, mineral water, pumice, quicksilver, stone (miscellaneous), sandstone.

NEVADA

Land area: 979 square miles.
Population: 19,283 (1940 census).
Location: North of Lake Tahoe on the eastern border of the State.
County seat: Nevada City.
References: State Mineralogist Report XVI:XVII:XVIII:XIX: XX:XXVI (April, 1930) :XXXI:XXXII:XXXV:XXXVI (July, 1941):XXXIX.

Nevada County, one of the mountain counties of California, for some years alternated with Amador in the gold lead, but both were passed by Yuba in 1918-1921, also 1923 and 1943. In 1922, 1924, 1929 to 1942, Nevada led all counties in gold output; held second place in 1926, 1927, and 1943, and third place in 1925, 1928, and 1944. Nevada County stands twenty-third on the list of counties in regard to value of its mineral output for 1945, with five different mineral substances, worth $1,196,433, as compared with $619,179 for 1944.

Commercial production for 1945 was as follows:

Substance	*Amount*	*Value*
Gold	33,163 fine ozs.	$1,160,705
Silver	12,285 fine ozs.	8,738
Stone, miscellaneous	----	11,990
Other minerals	----	15,000
Total value		$1,196,433

ORANGE

Land area: 782 square miles.
Population: 130,760 (1940 census).
Location: Southwest portion of the State, bordering Pacific Ocean.
County seat: Santa Ana.
References: State Mineralogist Report XV:XVII:XVIII:XIX:XX:XXI (Jan., 1925):XXXI:XXXV:XXXVII.

Orange County, in fourth place as to value of mineral output for 1945, produced eleven mineral substances worth $35,178,471, compared with $33,312,154 in 1944.

Commercial production for 1945 was as follows:

Substance	*Amount*	*Value*
Clay (pottery)	37,856 tons	$117,871
Gold	13 fine ozs.	455
Natural gas	26,433,452 M cu. ft.	1,735,206
Petroleum	32,214,458 bbls.	32,988,702
Stone, miscellaneous	----	306,581
Silver	2,655 fine ozs.	1,888
Zinc	25,683 lbs.	2,953
Unapportioned *	----	24,815
Total value		$35,178,471

* Includes copper, lead, salt.

PLACER

Land area: 1431 square miles.
Population: 28,108 (1940 census).
Location: Eastern border of State directly west of Lake Tahoe.
County seat: Auburn.
References: State Mineralogist Report XV:XVII:XVIII:XIX:XX:XXIII (July, 1927):XXXI:XXXII (Jan., 1936) XXXIX.

Placer County was in forty-second place in 1945 with ten different substances valued at $241,359, as compared with $250,237 in 1944.

Commercial production for 1945 was as follows:

Substance	*Amount*	*Value*
Gold	1,212 fine ozs.	$42,420
Silver	162 fine ozs.	115
Stone, miscellaneous	----	32,808
Unapportioned *	----	166,016
Total value		$241,359

* Includes brick, chromite, clay (pottery), granite, lead, slate.

PLUMAS

Land area: 2570 square miles.
Population: 11,548 (1940 census).
Location: Northeastern border of State, south of Lassen County.
County seat: Quincy.
References: State Mineralogist Report XVI:XVII:XVIII:XIX:XX:XXIV (Oct., 1928):XXIX:XXX:XXXIII (April, 1937):XXXVII:XXXIX.

Plumas County's mineral output for 1945 with six different mineral substances valued at $41,243, as compared with $78,714 in 1944.

In fifty-fifth place, commercial production for 1945 was as follows:

Substance	Amount	Value
Gold	28 fine ozs.	$980
Silver	8 fine ozs.	6
Stone, miscellaneous	----	19,800
Other minerals	----	20,457
Total value		$41,243

RIVERSIDE

Land area: 7179 square miles.
Population: 105,524 (1940 census).
Location: Southern portion of State.
County seat: Riverside.
References: State Mineralogist Report XV:XVII:XVIII:XX:XXV (Oct., 1929):XXX:XXXI:XXXIV-XXXVII (inc.) XLI (July, 1945).

Riverside is the fourth county in the State in size and thirteenth in regard to total value of mineral output for 1945. Within its borders are included mountains, desert, and agricultural land. In point of variety Riverside County showed twelve different mineral substances commercially produced in 1945 with a total value of $4,644,406, as compared with the 1944 output which was valued at $5,203,973. Commercial production for 1945 was as follows:

Substance	Amount	Value
Clay (pottery)	75,823 tons	$178,286
Stone, miscellaneous	----	498,373
Unapportioned *	----	3,967,747
Total value		$4,644,406

* Includes brick, cement, granite, gypsum, iron ore, limestone, manganese ore, mineral water, silica (glass sand).

SACRAMENTO

Land area: 985 square miles.
Population: 170,333 (1940 census).
Location: North-central portion of State.
County seat: Sacramento.
References: State Mineralogist Report XV:XVII:XVIII:XX:XXI (Jan., 1925):XXXI.

Sacramento stands ninth among the counties of the State as a mineral producer; the output for 1945 being valued at $9,240,880, as compared with the 1944 production, worth $7,832,687. In regard to gold output alone, this county ranks second, being exceeded by Nevada,

the Sacramento product coming from the dredges. With nine different mineral substances, commercial production for 1945 was as follows:

Substance	Amount	Value
Gold	32,851 fine ozs.	$1,149,785
Natural gas	88,406,045 M cu. ft.	6,736,811
Silver	1,509 fine ozs.	1,073
Stone, miscellaneous	----	1,177,108
Unapportioned *	----	176,103
Total value		$9,240,880

* Includes brick and hollow tile, clay (pottery), granite, platinum.

SAN BENITO

Land area: 1396 square miles.
Population: 11,392 (1940 census).
Location: West-central portion of State.
County seat: Hollister.
References: State Mineralogist Report XV : XVII : XVIII : XX : XXII (April, 1926) : XXXIV : XXXV : XXXIX : XLI.

San Benito County ranked twenty-first among the counties in regard to the value of total mining production for 1945, having an output worth $1,949,386, as compared with $1,985,039 for the previous year. Commercial output for 1945 included chromite, dolomite, quicksilver, miscellaneous stone.

SAN BERNARDINO

Land area: 20,131 square miles.
Population: 161,108 (1940 census).
Location: Southeastern portion of State.
County seat: San Bernardino.
References: State Mineralogist Report XV : XVII : XVIII : XIX : XXVI (July, 1930) : XXVII (July, 1931) : XXX : XXXIV-XXXVIII (inc.) : XXXIX (Oct., 1943) : XXXVIII : XXXIX (Oct., 1945).

San Bernardino, by far the largest county in the State in area, ranked sixth in regard to the value of mineral output for 1945, with a total of $23,038,011, as compared with $23,358,596, the total for 1944.

San Bernardino, for many years (except for 1918), has led all other counties in the State in point of variety of minerals, producing commercially in 1945 a total of twenty-nine different substances.

Substance	Amount	Value
Clay (pottery)	4,637 tons	$58,136
Copper	111,254 lbs.	15,019
Gold	1,060 fine ozs.	37,100
Lead	863,582 lbs.	74,268
Limestone	121,183 tons	285,827
Silver	33,021 fine ozs.	23,482
Stone, miscellaneous	----	718,409
Talc	34,011 tons	445,512
Zinc	131,588 lbs.	15,133
Unapportioned *	----	21,365,125
Total value		$23,038,011

* Includes bentonite, borates, brick, bromine, calcium chloride, cement, feldspar, granite, iron ore, lithia, mineral paint, mineral water, potash, salt, silica (quartz), soda ash, salt cake, strontium, tungsten ore.

SAN DIEGO

Land area: 4258 square miles.
Population: 289,348 (1940 census).
Location: Extreme southwest corner of State.
County seat: San Diego.
References: State Mineralogist Report XIV:XVII:XVIII:XIX:XX:XXI (July, 1925):XXX:XXXV (Jan., 1939):XXXVI-XXXVII:XXXIX.

San Diego ranked twenty-sixth in the total value of its mineral output for the year 1945 with eleven different mineral substances on the commerical list. The value for 1945 was $1,142,350, as compared with the 1944 output worth $1,985,032.

Commercial production for 1945 was as follows:

Substance	*Value*
Stone, miscellaneous	$645,781
Unapportioned *	496,569
Total value	$1,142,350

* Includes brick, bromine, granite, magnesium salts, mineral water, salt, silica (glass sand), pyrophyllite, tubemill pebbles.

SAN FRANCISCO

Land area: 45 square miles.
Population: 634,536 (1940 census).
County seat: San Francisco.
References: State Mineralogist Report XVII:XVIII:XX:XXV (April, 1929):XXXV:XXXVII.

Surprising as it may appear at first glance, San Francisco County is listed among the mineral-producing sections of the State, actual production consisting mainly of crushed rock, sand, gravel, mineral water, gold and silver from beach sands.

In fifty-first place, commercial production for 1945 had a total value of $75,172.

SAN JOAQUIN

Land area: 1410 square miles.
Population: 134,207 (1940 census).
Location: Central portion of State.
County seat: Stockton.
References: State Mineralogist Report XIV : XVII : XVIII : XXI (April, 1925).

San Joaquin County reported a mineral production for 1945 having a total value of $1,256,594, as compared with $1,369,198 for 1944.

In twenty-second place, commercial production for 1945 was as follows:

Substance	*Amount*	*Value*
Gold	7,343 fine ozs.	$257,005
Natural gas	9,377,104 M cu. ft.	670,838
Silver	754 fine ozs.	536
Stone, miscellaneous	----	226,531
Unapportioned *	----	101,684
Total value		$1,256,594

* Includes brick and hollow tile, clay (pottery), manganese ore.

SAN LUIS OBISPO

Land area: 3326 square miles.
Population: 33,246 (1940 census).
Location: Bordered by Kern County on the east and the Pacific Ocean on the west.
County seat: San Luis Obispo.
References: State Mineralogist Report XV : XVII : XVIII : XXI (Oct., 1925) :XXXI (Oct., 1935) :XXXV :XXXVII :XXXIX.

The total value of the mineral production of San Luis Obispo County in 1945, with seven different mineral substances, was $497,923, as compared with $704,818 in 1944.

In thirty-first place, commercial production for 1945 was as follows:

Substance	*Value*
Stone, miscellaneous	$70,102
Unapportioned *	427,821
Total value	$497,923

* Includes chromite, limestone, manganese ore, mineral water, petroleum, quicksilver.

SAN MATEO

Land area: 454 square miles.
Population: 111,782 (1942 census).
Location: Peninsula, adjoined by San Francisco on the north.
County seat: Redwood City.
References: State Mineralogist Report XVII :XVIII :XXV (April, 1929) :XXIX :XXXV :XXXIX.

San Mateo County had a mineral output in 1945 of five different substances, having a total value of $2,363,508, as compared with $2,452,525 in 1944.

In eighteenth place, commercial production for 1945 was as follows:

Substance	Value
Stone, miscellaneous	$273,824
Unapportioned *	2,089,684
Total value	$2,363,508

* Includes cement, limestone (shells), magnesia.

SANTA BARBARA

Land area: 2745 square miles.
Population: 70,555 (1940 census).
Location: Southwestern portion of State, adjoining San Luis Obispo on the south.
County seat: Santa Barbara.
References: State Mineralogist Report XV :XVII :XVIII :XIX : XXI (Oct., 1925) :XXXII :XXXV.

Santa Barbara County owes its position of seventh place in the State in regard to its mineral output to the presence of productive oil fields within its boundaries. The total value of its mineral production

during the year 1945 was $22,643,580, as compared with $23,908,079, the output for 1944.

With five different substances, commercial production for 1945 was as follows:

Substance	*Amount*	*Value*
Natural gas	16,031,402 M cu. ft.	$863,157
Petroleum	23,140,412 bbls.	19,397,091
Stone, miscellaneous	----	34,931
Unapportioned *	----	2,348,401
Total value		$22,643,580

* Includes brick, clay (pottery), diatomite.

SANTA CLARA

Land area: 1305 square miles.
Population: 174,949 (1940 census).
Location: West-central portion of State.
County seat: San Jose.
References: State Mineralogist Report XVII:XVIII:XXI:XXVI (Jan., 1930):XXIX:XXXV.

Santa Clara County reported a mineral output for 1945 of $5,810,388, as compared with $5,228,668, the figure for 1944.

In eleventh place, with ten mineral substances, commercial production for 1945 was as follows:

Substance	*Amount*	*Value*
Limestone (part shells)	45,274 tons	$138,122
Stone, miscellaneous	----	651,021
Unapportioned *	----	5,021,245
Total value		$5,810,388

* Includes brick, cement, clay (pottery), gems, magnesite, petroleum, quicksilver.

SANTA CRUZ

Land area: 439 square miles.
Population: 45,057 (1940 census).
Location: Bordering Pacific Ocean, just south of San Mateo County.
County seat: Santa Cruz.
References: State Mineralogist Report XVII:XVIII:XXII (Jan., 1926):XXIX:XXXIX (Jan., 1943).

The mineral output of Santa Cruz County amounted to a total of $2,015,407 for 1945, giving the county a standing of twentieth among others in the State in this regard. The 1944 figure was $1,762,807.

Commercial production for 1945 included bituminous rock, cement, gold, iron ore, limestone, miscellaneous stone, silver.

SHASTA

Land area: 3846 square miles.
Population: 28,800 (1940 census).
Location: North-central portion of State.
County seat: Redding.
References: State Mineralogist Report XIV:XVII:XVIII:XIX:XXII (April, 1926):XXIX (Jan., April, 1933):XXX:XXXIV:XXXV (April, 1939):XXXVI:XXXIX.

Shasta County stood nineteenth in California among the mineral-producing counties in 1945, with an output valued at $2,119,802, as compared with the 1944 production worth $2,615,373.

With twelve different mineral substances, commercial production for 1945 was as follows:

Substance	Amount	Value
Copper	3,777,988 lbs.	$510,028
Gold	4,794 fine ozs.	167,790
Lead	57,599 lbs.	4,954
Silver	94,462 fine ozs.	67,173
Stone, miscellaneous	----	144,849
Zinc	4,026,545 lbs.	463,053
Unapportioned *	----	761,955
Total value		$2,119,802

* Includes asbestos, iron ore, limestone, pyrite.

SIERRA

Land area: 958 square miles.
Population: 3,025 (1940 census).
Location: Eastern border of State just north of Nevada County.
County seat: Downieville.
References: State Mineralogist Report XVI:XVII:XVIII:XX: XXV (April, 1929):XXXI:XXXVIII (Jan., 1942):XXXIX.

Sierra County reported a mineral production of $172,800 in 1945, which was mainly gold, as compared with the 1944 output worth $114,195.

In forty-seventh place, commercial production for 1945 was as follows:

Substance	Amount	Value
Gold	4,848 fine ozs.	$169,680
Silver	846 fine ozs.	602
Other minerals	----	2,500
Total value		$172,782

SISKIYOU

Land area: 6313 square miles.
Population: 28,598 (1940 census).
Location: Extreme north-central portion of State, next to Oregon boundary.
County seat: Yreka.
References: State Mineralogist Report XIV:XVII:XVIII:XIX: XX:XXI (Oct., 1925):XXVIII (Jan., 1931):XXIX:XXX: XXXI (July, 1935):XXXIV:XXXV:XXXVII:XXXIX.

Siskiyou, fifth county in California in regard to size, located in highly mineralized and mountainous country, ranks twenty-seventh in regard to mineral output with ten mineral substances for 1945. The 1944 production was valued at $2,507,921.

Commercial production for 1945 was as follows:

Substance	Amount	Value
Copper	4,042,866 lbs.	$545,787
Gold	2,667 fine ozs.	93,345
Pumice	5,230 tons	36,470
Silver	2,530 fine ozs.	1,799
Stone, miscellaneous	----	145,327
Unapportioned *	----	103,577
Total value		$926,305

* Includes chromite, diatomite, limestone, mineral water.

SOLANO

Land area: 827 square miles.
Population: 49,118 (1940 census).
Location: Touching San Francisco Bay on the northeast.
County seat: Fairfield.
References: State Mineralogist Report XIV:XVII:XXIII (April, 1927):XXXV.

Solano, although mostly valley land, produced mineral substances during 1945 to the total value of $5,282,725, ranking in twelfth place among the counties of the State, compared with the 1944 output worth $5,973,575.

Commercial production for 1945 was as follows:

Substance	Amount	Value
Natural gas	62,376,521 M cu. ft.	$5,245,415
Other minerals	----	37,310
Total value		$5,282,725

SONOMA

Land area: 1579 square miles.
Population: 69,052 (1940 census).
Location: South of Mendocino County, bordering on the Pacific Ocean.
County seat: Santa Rosa.
References: State Mineralogist Report XIV:XVII:XVIII:XXII (July, 1926):XXXV, XXXIX.

Sonoma County ranked twenty-eighth among the counties of California during 1945 with a mineral output valued at $807,122, compared with $905,121, the 1944 figure.

Commercial production for 1945 included granite (tuff), mineral water, quicksilver, miscellaneous stone.

STANISLAUS

Land area: 1506 square miles.
Population: 74,866 (1940 census).
Location: Center of State bounded on south by Merced County.
County seat: Modesto.
References: State Mineralogist Report XIV:XVII:XVIII:XXI (April, 1925):XXXV, XXXIX.

Gold has usually been the chief mineral product of Stanislaus County, but it was exceeded in 1918-1919 and 1944 by manganese, and in 1921-1923, 1925-1934 and 1943 by miscellaneous stone. This county for 1945 ranked thirty-sixth in the State in regard to minerals, with an output valued at $406,727, as compared with $545,376 in 1944.

Commercial production for 1945 was as follows:

Substance	Amount	Value
Gold	7,544 fine ozs.	$264,040
Silver	516 fine ozs.	366
Stone, miscellaneous	----	112,932
Unapportioned *	----	29,389
Total value		$406,727

* Includes manganese ore, natural gas, platinum.

SUTTER

Land area: 607 square miles.
Population: 18,680 (1940 census).
Location: Bounded by Butte County on the north and Sacramento on the south.
County seat: Yuba City.
References: State Mineralogist Report XV:XVII:XVIII:XXXIX.

Sutter is one of only two counties in the State which for a number of years reported no commercial output of some kind of mineral substance. In 1917 some crushed rock was taken out, from the Marysville Buttes, also in 1925-1928, and 1937-1938. Some utilization of natural gas and clay has been made. Coal is found here, but no deposits of it have been placed on a productive basis.

During 1945 a commercial output of pottery clay, and natural gas was reported, having a total value of $62,910, and it ranked fifty-fifth as a mineral-producing county. The 1944 total was $89,246.

TEHAMA

Land area: 2874 square miles.
Population: 14,316 (1940 census).
Location: North-central portion of the State, bounded on the north by Shasta.
County seat: Red Bluff.
References: State Mineralogist Report XV : XVII : XVIII : XIV : XXIV (July, 1928) :XXXVII :XXXIX.

Tehama County stood fifty-third among the mineral-producing counties of the State for 1945, with an output valued at $69,921, compared with the 1944 value of $101,823. Commercial production in 1945 was as follows:

Substance	*Value*
Stone, miscellaneous	$23,150
Other minerals	46,771
Total value	$69,921

TRINITY

Land area: 3191 square miles.
Population: 3970 (1940 census).
Location: Northwestern portion of State.
County seat: Weaverville.
References: State Mineralogist Report XIV:XVII:XVIII:XIX: XX : XXII (Jan., 1926) : XXIX (Jan., April, 1933) : XXX : XXXIV:XXXV:XXXVII (Jan., 1941), XXXIX.

Trinity County's output of minerals was valued at $91,560 for 1945, as compared with the 1944 figure of $516,066, which gives the county a rank of fiftieth for the year.

Commercial production for 1945 was as follows:

Substance	*Amount*	*Value*
Gold	1,824 fine ozs.	$63,840
Silver	180 fine ozs.	128
Unapportioned *	----	27,592
Total value		$91,560

* Includes coal, manganese ore, quicksilver, miscellaneous stone.

TULARE

Land area: 4845 square miles.
Population: 107,152 (1940 census).
Location: Bounded by Inyo on the east, Kern on the south, Fresno on the north.
County seat: Visalia.
References: State Mineralogist Report XV:XVII:XVIII:XX: XXXVI:XXXVII:XXXVIII:XXXIX.

Tulare County stands forty-first on the list of mineral-producing counties for 1945, with three different mineral substances, having a total value of $256,764, as compared with $615,630 for 1944.

Commercial production for 1945 was as follows:

Substance	*Value*
Stone, miscellaneous	$159,400
Unapportioned *	97,364
Total value	$256,764

* Includes natural gas, tungsten ore.

TUOLUMNE

Land area: 2275 square miles.
Population: 10,887 (1940 census).
Location: East-central portion of State—Mother Lode District.
County seat: Sonora.
References: State Mineralogist Report XIV:XVII:XVIII:XIX: XX:XXIV (Jan., 1928):XXXIV:XXXV:XXXVI:XXXIX: XL.

Tuolumne County ranks fifty-fourth among the counties of the State relative to its total value of mineral output for 1945, with eight different substances. The mineral production for 1945 was valued at $434,626, as compared with $465,734 for 1944.

Commercial production for 1945 was as follows:

Substance	*Amount*	*Value*
Gold	4,696 fine ozs.	$164,360
Silver	2,808 fine ozs.	1,997
Stone, miscellaneous	----	28,275
Unapportioned *	----	239,994
Total value		$434,626

* Includes dolomite, limestone, soapstone, clay (pottery).

VENTURA

Land area: 1857 square miles.
Population: 69,685 (1940 census).
Location: Southwestern portion of State, bordering on Pacific Ocean.
County seat: Ventura.
References: State Mineralogist Report XV : XVII : XVIII : XX : XXI:XXVIII (July-Oct., 1932):XXXVII.

Ventura is fifth in the State in respect to the value of its mineral output for 1945. The 1945 mineral production was worth $29,352,740, as compared with the 1944 output valued at $30,545,897.

With eight different mineral substances, commercial production for 1945 was as follows:

Substance	Amount	Value
Natural gas	55,451,887 M cu. ft.	$3,049,832
Petroleum	24,638,277 bbls.	25,705,785
Stone, miscellaneous	----	366,981
Unapportioned *	----	230,142
Total value		$29,352,740

* Includes clay (oil well drilling), gypsum, limestone, sandstone.

YOLO

Land area: 1034 square miles.
Population: 27,243 (1940 census).
Location: Sacramento Valley, bounded by Sutter on the east and Colusa on the north.
County seat: Woodland.
References: State Mineralogist Report XIV:XVII:XVIII:XXXV, XXXIX, XLI.

Yolo County, in thirty-fourth place, had a commercial production for 1945 as follows, compared with $394,299 the preceding year.

Substance	Value
Stone, miscellaneous	$118,309
Unapportioned *	361,501
Total value	$479,810

* Includes natural gas, quicksilver.

YUBA

Land area: 638 square miles.
Population: 17,034 (1940 census).
Location: Lies west of Sierra and Nevada counties; south of Plumas.
County seat: Marysville.
References: State Mineralogist Report XV : XVII : XVIII : XX : XXVI (July, 1930) :XXXI.

In 1945 Yuba County ranked twenty-fourth among the counties of the State as a mineral producer. Gold is obtained mainly by dredges. The 1944 output was valued at $1,106,311.

Commercial production for 1945 was as follows:

Substance	Amount	Value
Gold	29,594 fine ozs.	$1,035,790
Silver	1,434 fine ozs.	1,020
Stone, miscellaneous	----	147,416
Other minerals	----	1,913
Total value		$1,186,139

With eight different mineral substances, commercial production for 1945 was as follows:

Yolo County, in thirty-fourth place, had a commercial production for 1945 as follows, compared with [illegible] the preceding year.

Land area: 1015 square miles.
Population: 27,845 (1940 census).
Location: Sacramento Valley, bounded by Solano on the east and
(Cities on the north).
County seat: Woodland.
Reference: State Mineralogist Report XLV:339-340; XLVIII:XXXV,
XXXIX, XLI.

Yolo County, in thirty-fourth place, had a commercial production for 1945 as follows, compared with [illegible] the preceding year.

Land area: 1015 square miles.
Population: 27,845 (1940 census).
Location: Sacramento Valley, bounded by Solano on the east and
(Cities on the north).
County seat: Woodland.
Reference: State Mineralogist Report XLV:339-340; XLVIII:XXXV,
XXXIX, XLI.

In 1945 Yolo County ranked twenty-fourth among the counties of [illegible] as a mineral producer. Gold is obtained mainly by dredging. The 1944 output was valued at $1,760,311.

Commercial production for 1945 was as follows:

CHAPTER SEVEN

DIRECTORY OF PRODUCERS OF METALLIC AND NON-METALLIC MINERALS IN CALIFORNIA 1945

NOTE.—The producers of natural gas and petroleum will be found in the quarterly Summary of Operations, California Oil Fields, for July to December, 1945 (Vol. 31, No. 2).

CHAPTER SEVEN

DIRECTORY OF PRODUCERS OF METALLIC AND NONMETALLIC MINERALS IN CALIFORNIA, 1918

NOTE.—The producers of natural gas and petroleum will be found in the quarterly Summary of Operations, California Oil Fields, for July to December, 1918 (Vol. 31, No. 1).

ASBESTOS

Operator	Product	Address	Location of mine
Napa County			
Kohler & Chase, Geo. Q. Chase	a	26 O'Farrell St., San Francisco	Steel Canyon
Shasta County			
Powhatan Mining Co.	b	Woodlawn, Baltimore, Md.	Sims

[a] Chrysotile short fiber.
[b] Tremolite.

BARYTES

Operator	Address	Location of mine
Mariposa County		
Baroid Sales Division, National Lead Co.	830 Ducommun St., Los Angeles	El Portal
Nevada County		
Baroid Sales Division, National Lead Co.	830 Ducommun St., Los Angeles	Washington
Plumas County		
Barium Products Ltd.	Newark	Almanor

* Sold property to Baroid Sales Division, National Lead, during year.

BENTONITE (FULLER'S EARTH)

Operator	Address	Location of pit
Inyo County		
W. R. Cantley	Olancha	Olancha
Los Angeles Chemical Co.*	1960 Santa Fe Ave., Los Angeles	
San Bernardino County		
Baroid Sales Division, National Lead Co.	830 Ducommun St., Los Angeles	Hector
Pacific Bentonite Mine, Louis Martinez	Box 374, Red Mountain	Red Mountain

* Expect to produce in 1946.

BITUMINOUS ROCK

Operator	Address	Location of mine
Santa Cruz County		
Calrock Asphalt Co.	232 Montgomery St., San Francisco	Majors

BORATES

Operator	Address	Location of property
Inyo County		
Pittsburgh Plate Glass Co., Columbia Chemical Division	Bartlett	Bartlett
United States Borax Co.	510 W. 6th St., Los Angeles	Death Valley
Kern County		
Pacific Coast Borax Co.	510 W. 6th St., Los Angeles	Kramer
San Bernardino County		
American Potash and Chemical Corp.	Trona	Trona
West End Chemical Co.	Latham Square Bldg., Oakland	West End

BROMINE

Operator	Address	Location of property
Alameda County		
Westvaco Chlorine Prod. Corp.	405 Lexington Ave., New York, N. Y.	Newark
San Bernardino County		
American Potash and Chemical Co.	Trona	Trona
San Diego County		
Westvaco Chlorine Prod. Corp.	405 Lexington Ave., New York, N. Y.	San Diego

CALCIUM CHLORIDE

Operator	Address	Location of mine
San Bernardino County		
California Rock Salt Co.	2465 Hunter St., Los Angeles	Amboy

CARBON DIOXIDE GAS

Operator	Address	Location of wells
Imperial County		
Anthony-Rivers Development Corp.	*1001 N. Stunly Ave., Los Angeles 46	Niland
Cardox Western, Inc.	748 Washington Blvd., Los Angeles 21	Niland
Mendocino County		
Caldri Ice Corp.	1168 Battery St., San Francisco	Hopland

* Probable producer 1946.

CEMENT

Operator	Address	Location of mill
Calaveras County		
Calaveras Cement Co.	315 Montgomery St., San Francisco 4	San Andreas
Contra Costa County		
Henry Cowell Lime and Cement Co.	2 Market St., San Francisco 11	Cowell
Kern County		
Monolith Portland Cement Co.	Bartlett Bldg., Los Angeles	Monolith
Los Angeles County		
Blue Diamond Corp.	1650 S. Alameda St., Los Angeles	Los Angeles
Riverside County		
Riverside Cement Co.	621 S. Hope St., Los Angeles	Riverside
San Bernardino County		
California Portland Cement Co.	601 W. Fifth St., Los Angeles	Colton
Riverside Cement Co.	621 South Hope St., Los Angeles	Oro Grande
Southwestern Portland Cement Co.	503 Roosevelt Bldg., Los Angeles	Victorville
San Mateo County		
Pacific Portland Cement Co.	417 Montgomery St., San Francisco 1	Redwood City
Santa Clara County		
Permanente Cement Co.	Permanente	Permanente
Santa Cruz County		
Santa Cruz Portland Cement Co.	Crocker Bldg., San Francisco	Davenport

CHROMITE

Principal Shippers in 1945 Out of a Total of 30 Operating Properties

Mine	Operator	Address	Location of mine
Del Norte County			
Big Dipper	Tyson Chrome Mines, Inc.	406 Montgomery St., San Francisco	Crescent City
4th of July	C. H. McClendon	Crescent City	Crescent City
High Plateau	Eugene Brown	O'Brien, Oregon	Crescent City
Webb	F. Linkhart & E. H. Messenger	Kerby, Oregon	Patricks Creek
El Dorado County			
Pilliken	Taylor Chrome Mines, Inc.	206 Kohl Bldg., San Francisco 4	Folsom
Placer County			
Capital Co. property	Thad Greene	Forest Hill	Forest Hill
Capital Co. property	B. S. & H. R. Marall	Forest Hill	Iowa Hill
San Luis Obispo County			
Castro	Castro Chrome Associates	232 Montgomery St., San Francisco	San Luis Obispo
Shasta County			
Round Bottom	C. A. Withington	Platina	Platina
Siskiyou County			
Dry Gulch	Luther Lake	Cecilville	Cecilville
Fairview	H. E. Ellickson	640 Lane St., Yreka	Hamburg
Lady Gray	Mrs. Dorothea Reddy Moroney	Klamath River	Klamath River
Mountain House	Ben Baker	Yreka	Yreka
Peg Leg (Lambert)	Ben Baker	Yreka	Fort Jones
Tehama County			
Franklin	James E. Atkinson	Red Bluff	Red Bluff
McLaughlin—Applegarth Lease	Geo. A. Applegarth	1628 Russ Bldg., San Francisco	Red Bluff
Trinity County			
Shasta Lilly	Philip C. Munko	Castella	Castella

CLAY

(Including producers of crude clay; and manufacturers of brick, tile, porcelain, etc.)

Operator	Remarks	Address	Location of plant or pit
Alameda County			
California Pottery Co.	a, c	Niles	Niles
N. Clark & Sons	a, b	401 Pacific Ave., Alameda	Alameda
Henry J. Kaiser Co.	c	Kaiser Bldg., 1924 Broadway, Oakland	Radum
Kraftile Co.	a, b, c	Niles	Niles
M. & S. Tile Co., Geo. A. Smith	a, c	Decoto	Decoto
Amador County			
Cal. Mineral Products Co., Ione Clay and Sand Pit	c, f	Kohl Bldg., San Francisco	Ione
N. Clark & Sons	c	401 Pacific Ave., Alameda	Ione
Pacific Clay Products	c	Box 145, Station A, Los Angeles	
Western Refractories Co.	b, c	Russ Bldg., San Francisco	Ione
Calaveras County			
California Pottery Co.	c	Niles	Valley Springs
Contra Costa County			
American Radiator & Standard Sanitary Mfg. Co., H. W. Creeger, Mgr.	a	Box W. Richmond	Richmond
Gladding-McBean & Co.	b	2901 Los Feliz Blvd., Los Angeles	Pittsburg
Port Costa Brick Works, C. G. Berg, Pres.	b	Sixth and Berry Sts., San Francisco	Port Costa
Technical Porcelain & Chinaware Co.	a	Manila and Kearney Sts., El Cerrito	El Cerrito
United Materials & Richmond Brick Co., Ltd.	a, b	Box 7, Richmond	Richmond
Fresno County			
Craycroft Brick Co.	a, b, c	Belmont and Lafayette Sts., Fresno	Fresno
Inyo County			
W. R. Cantley	e	Olancha	Olancha
Los Angeles Chemical Co.	e	196 Santa Fe Ave., Los Angeles	Olancha
Kern County			
American Minerals Co.	c	5601 S. Boyle, Los Angeles	Cantil
Macco Construction Co., dba Antelope Mud Co.	d	815 Paramount Bldg., Clearwater	Rosamond
McKittrick Mud Co., C. C. Sherpenburg	d	McKittrick	McKittrick
Mojave Corp.	d	Box 174, Los Nietos	Frazier Park
Los Angeles County			
American Container Co., Inc.	a	3132 E. Pico Blvd., Los Angeles	Los Angeles
Angulo Tile Co.	a, c	Reseda	Reseda
B. & W. Tile Manufacturing Co.	a	14600 S. Western Ave., Los Angeles	Los Angeles
J. A. Bauer Pottery Co.	a	415 W. Ave. 33, Los Angeles	Los Angeles
Builders Brick Co., Ltd.	b	17602 S. Western Ave., Moneta	Moneta and Compton
H. F. Coors Co., Inc.	a	Inglewood	Inglewood

Davidson Brick Co.	b	4701 Floral Dr., Los Angeles	Los Angeles
General Refractories Co.	b	3363 Fruitland Road, Los Angeles	Los Angeles
Gladding, McBean & Co., Tropico, L. A. & S. M. Plants	a, b, c	2901 Los Feliz Blvd., Los Angeles	Tropico, Los Angeles; Santa Monica, Hermosa Beach and Vernon
Higgins Brick & Tile Works	a, b, c	Box 525, Moneta	Moneta
Italian Terra Cotta Co.	a	1149 Mission Rd., Los Angeles	Los Angeles
Pacific Clay Products	a, b, c	Box 145, Sta. A, Los Angeles	Los Angeles and Los Nietos
Pacific Tile & Porcelain Co.	a	1270 Olive, Haynes	Haynes
Pomona Brick Co., S. Bernard Strona	b	Pomona	Pomona
Pomona Tile Mfg. Co.	a	629 N. La Brea Ave., Los Angeles	Pomona
St. Louis Fire Brick & Insulation Co.	b	3050 E. Slauson St., Huntington Park	Huntington Park
San Valle Tile Kilns	a, c	1258 N. Highlands Ave., Los Angeles	Reseda
Simons Brick Co., Walter R. Simons	a, b, c	1195 S. Boyle Ave., Los Angeles	Los Angeles
Vernon Potteries	a	2300 E. 52d St., Los Angeles	Vernon
Vitrefax Co.	a, b, c	5050 Pacific Blvd., Los Angeles	Los Angeles
Marin County			
McNear Brick Co.	a, c	McNear Point, San Rafael	McNear
Orange County			
El Toro Clay Co., I. P. Arnold	c	655 W. Second St., Los Angeles	El Torro
Gladding, McBean & Co.	c	2901 Los Feliz Blvd., Los Angeles	Gypsum
La Bolsa Tile Co.	a, c	R.F.D. 1, Box 174, Huntington Beach	Smeltzer
Tierra Colorado Clay Co.	c	Box 441, San Juan Capistrano	San Juan Capistrano
Placer County			
Gladding, McBean & Co.	a, b, c	2901 Los Feliz Blvd., Los Angeles	Lincoln
Lincoln Clay Products Co.	c	Lincoln	Lincoln
Riverside County			
Alberhill Coal & Clay Co.	c	Box 4267, Village St., Los Angeles	Alberhill
Los Angeles Brick Co.	a, b, c	1078 Mission Rd., Los Angeles	Alberhill
Pacific Clay Products	c	Box 145, Sta. A, Los Angeles	Corona
Temescal Clay Co.	c	2596 Clarendon Ave., Huntington Park	Temescal
Sacramento County			
Cannon & Co.	a, b, c	Box 802, Sacramento	Ben Ali
Gladding Bros. Mfg. Co.	c	Third and Keyes Sts., San Jose	Folsom
H. C. Muddox, Jessie E. Muddox, Owner	a	30th and L Sts., Sacramento	Sacramento
Panama Pottery Co.	a	R.F.D. 4, Box 1478, 24th St. Rd., Sacramento	Sacramento
Sacramento Brick Co.	b	1300 Front St., Sacramento	Sacramento
San Bernardino County			
Baroid Sales Div., National Lead Co.	d, e	830 Ducommun St., Los Angeles	Hector
Hancock Brick Yard, C. P. Hancock & Son	b	Riverside	Highgrove
Gladding-McBean & Co.	c	2901 Los Feliz Blvd., Los Angeles	Goff
Master Mining Co.	c	530 W. Sixth St., Los Angeles 14	Bryman
Pacific Bentonite Mine, Louis Martinez	e	Box 374, Red Mountain	Red Mountain
Southern California Minerals Co., W. K. Skeoch	c	320 S. Mission Rd., Los Angeles	Goff

CLAY—Continued

(Including producers of crude clay; and manufacturers of brick, tile, porcelain, etc.)

Operator	Remarks	Address	Location of plant or pit
San Diego County			
Union Brick Co., J. W. Rice	b	P.O. Box 356, North San Diego	Rose Canyon
San Joaquin County			
Laurel Potteries	a	McKinley Ave., Stockton	Stockton
Pacific Clay Products Co.	a, c	Box 145, Station A, Los Angeles	Stockton
San Joaquin Brick Co.	b	33 S. El Dorado St., Stockton	Stockton
Stockton Brick & Tile Co.	b	McKinley Ave., Stockton	Stockton
Santa Barbara County			
McNall Building Materials	a, b, c	208 N. Salsipuedes, Santa Barbara	Santa Barbara
Santa Clara County			
Garden City Pottery	a	560 N. Sixth St., San Jose	San Jose
Gladding Bros. Mfg. Co.	a, c	S. Third and Keyes Sts., San Jose	San Jose
Myers Ceramic Pottery, F. Hinz	a	Box 97, Santa Clara	Santa Clara
Remillard-Dandini Co.	b	569 Third St., Oakland	San Jose
Sutter County			
Gladding, McBean & Co.	c	2901 Los Feliz Blvd., Los Angeles	Nicolaus
Tuolumne County			
Lester Raggio	c	Knights Ferry	Knights Ferry
Ventura County			
Shell Oil Co., Dent Clay Pit	d	Shell Bldg., San Francisco	Ventura

a. Clay products. b. Brick and hollow building-tile. c. Crude clay. d. Oil-well drilling-mud. e. Filtering clay. f. Fire sand.

COAL

Operator	Address	Location of mine
Trinity County		
Trinity Coal Co., Wm. A. Mumford	Weaverville	Douglas City

COPPER

Principal Copper Producers in California in 1945 (Not Less Than 10,000 Pounds)

Mine	Operator	Address	Post office of mine
Amador County			
Newton	Winston Copper Co.	Subway Terminal Bldg., Los Angeles	Ione
Butte County			
Big Bend	Hoefling Bros.	1820 D St., Sacramento	Oroville
Calaveras County			
Keystone	Keystone Copper Corporation	Copperopolis	Copperopolis
Penn	Miller and Clemson	4800 Santa Fe Ave., Los Angeles	Campo Seco
Union	Pacific Mining Co.	1022 Crocker Bldg., San Francisco	Farmington
Inyo County			
Columbia No. 2	Finley Co.	Tecopa	Tecopa
Darwin Group	Anaconda Copper Mining Co.	Box 58, Darwin	Darwin
Modoc	L. D. Forman & Co.	850 S. Fourth West St., Salt Lake City, Utah	Trona
Madera County			
Daulton	Ace H. Alexander	Daulton	Daulton
Mariposa County			
Blue Moon	Red Cloud Mines, Inc.	Hornitos	Hornitos
San Bernardino County			
Mohawk	Dunton-Ray & Greenwood	Ivanpah	Ivanpah
New Trail	New Trail Mining Co.	Cima	Cima
Roosevelt	Donald F. Love	Ludlow	Ludlow
Shasta County			
Afterthought	Jordan and Glennan	Redding	Redding
Hornet (Mattie Orebody)	The Mountain Copper Co.	216 Pine St., San Francisco	Matheson
Siskiyou County			
Dakin (Gray Eagle)	Gray Eagle Copper Co.	Yreka	Happy Camp

DIATOMITE (DIATOMACEOUS EARTH)

Operator	Address	Location of mine or quarry
Los Angeles County		
Great Lakes Carbon Corp., Dicalite Division	756 S. Broadway, Los Angeles 14	San Pedro
Santa Barbara County		
Johns-Manville Products Corp.	Lompoc	Lompoc
Lompoc Diatomite Co.	405 Montgomery St., San Francisco	Lompoc
Siskiyou County		
H. W. Free	Tionesta	Tionesta

DOLOMITE

Operator	Address	Location of quarry
Monterey County		
Permanente Metals Corp.	Permanente	Natividad
San Benito County		
Archie E. Hamilton	Hollister	Hollister
Tuolumne County		
U. S. Lime Products Corp.*	85 Second St., San Francisco	Sonora

* Output partly calcined for use as lime.

FELDSPAR

Operator	Address	Location of mine
San Bernardino County		
Gladding, McBean & Co.	2901 Los Feliz Blvd., Los Angeles	

FLUORSPAR

Operator	Address	Location of mine
Riverside County		
N. A. Anderson	Box 691, Blythe	Rice

GARNETS (Abrasive)

Operator	Address	Location of property
Inyo County		
Huntly Mines	P.O. Box, Bishop	Bishop

GOLD

Principal Gold Producers, Not Less Than 200 Ounces, in California, Including Placer and Lode Mines in 1945

Mine	Type of mine	Operator	Address	Post office of mine
Butte County				
Big Bend	o	Hoefling Bros., Inc.	1820 D St., Sacramento	Oroville
Butte Unit	e	Yuba Consolidated Gold Fields	351 California St., San Francisco 4	Hammonton
Kister	e	Gold Hill Dredging Co.	311 California St., San Francisco 4	Oroville
Morris Ravine	f	Morris Ravine Mining Co.	Box 7, Oroville	Oroville
Calaveras County				
Penn	o	Miller and Clemson	4800 Santa Fe Ave., Los Angeles	Campo Seco
El Dorado County				
Hoosier Gulch (Boat No. 2)	h	Hoosier Gulch Placers	1015 25th St., Sacramento	----------
Inyo County				
Columbia No. 2	m	Finley Company	Tecopa	Tecopa
Darwin Group	p	Anaconda Copper Mining Co.	Box 58, Darwin	Darwin
Kern County				
Kern Rock Co. Gravel Plant	t	Kern Rock Company	Box 1697, Bakersfield	Bakersfield
Tropico	a	Burton Bros., Inc.	Rosamond	Rosamond
Mariposa County				
Blue Moon	o	Red Cloud Mines, Inc.	Hornitos	Hornitos
Mount Gaines	a	Mount Gaines Mining Co.	Hornitos	Hornitos
Schroeder Group	a	Schroeder, Odgers, & Schroeder	Midpines	Midpines
Merced County				
Merced Dredge No. 1	e	Merced Dredging Co.	1805 Mills Bldg., San Francisco	La Grange
Nevada County				
Ancho and Erie Groups	a	Ancho-Erie Mining Co.	401 Second St., San Francisco 7	Nevada City
Empire Star Group	a	Empire Star Mines Co., Ltd.	Grass Valley	Grass Valley
Idaho-Maryland and New Brunswick	a	Idaho-Maryland Mines Corp.	Russ Building, San Francisco 4	Grass Valley
----------	c	Jordan E. Glennan	Colfax	Nevada City
Placer County				
Mammoth Bar	h	Golden Feather Dredging Co.	c/o E. A. Wiltsee, Pacific Union Club, San Francisco	Auburn
Sacramento County				
Capital Dredge	e	Capital Dredging Co.	351 California St., San Francisco 4	Fair Oaks
Lancha Plana Dredge	e	Lancha Plana Gold Dredging Co.	La Lomita Rancho, Lockeford	Lockeford
Natomas	e	Natomas Co.	Forum Building, Sacramento	Natoma

San Bernardino County				
Roosevelt	a	Donald F. Love, Assn.	Ludlow	Ludlow
San Joaquin County				
Lower Camanche Dredge	e	Gold Hill Dredging Co.	311 California St., San Francisco 4	Camanche
Upper Camanche Dredge	e	Gold Hill Dredging Co.	311 California St., San Francisco 4	Camanche
Shasta County				
French Gulch Dredge	e	French Gulch Dredging Co.	307 Russ Bldg., San Francisco 4	French Gulch
Hornet (Mattie Orebody)	s	The Mountain Copper Co., Ltd.	216 Pine St., San Francisco	Matheson
St. Jude	a	St. Jude Mining Co.	French Gulch	French Gulch
Thurman Dredge	e	Thurman Gold Dredging Co.	235 Montgomery St., San Francisco 4	Redding
Sierra County				
Brush Creek	a	Alfred L. Merritt	3015 Garber Road, Berkeley 5	Goodyears Bar
Original Sixteen to One	a	Original Sixteen to One Mine, Inc.	1611 Russ Bldg., San Francisco 4	Alleghany
Siskiyou County				
Dakin (Gray Eagle)	j	Gray Eagle Copper Co.	Yreka	Happy Camp
Siskiyou Unit	e	Yuba Consolidated Gold Fields	351 California St., San Francisco 4	Callahan
Yreka Gold Dredge	e	Yreka Gold Dredging Co.	220 Montgomery St., San Francisco 4	Seiad Valley
Stanislaus County				
La Grange Dredge No. 4	e	La Grange Gold Dredging Co.	1805 Mills Tower, San Francisco	La Grange
Tuolumne Dredge	e	Tuolumne Gold Dredging Co.	1 Sansome St., San Francisco 4	La Grange
Trinity County				
Junction City Dredge	e	Junction City Mining Co.	Junction City	Junction City
Tuolumne County				
Eagle Shawmut	a	Miller and Clemson	4800 Santa Fe Ave., Los Angeles	Chinese Camp
Yuba County				
Yuba Unit	e	Yuba Consolidated Gold Fields	351 California St., San Francisco	Hammonton

a. Lode, gold mine. b. Gold-silver mine. c. Tailings dumps. d. Pocket. e. Dredge (bucketline). f. Drift mine. g. Hydraulic mine. h. Dragline operations. j. Copper-owld mine. k. Power shovel or dryland dredge. m. Lead mine. n. Suction dredge. o. Zinc mine. p. Silver-lead-zinc. r. Tungsten mine. s. Copper-zinc mine. t. Gravel plant.

GRANITE

Operator	Product	Address	Location of quarry
Fresno County			
Superior-Academy Granite Co.	a	Clovis	Academy
Lassen County			
Greig Quarry, J. B. Wagender	a	Susanville	Susanville
Placer County			
Union Granite Co., Ruhkala Bros.	a	Rocklin	Rocklin
Victor Wickman	a	Rocklin	Rocklin
Riverside County			
Emil Johnson	a	Perris	Perris
San Bernardino County			
Texas Quarries, Inc.	a	Box 605, Victorville	Victorville
San Diego County			
Crystal Black Quarry, John Stridsburg	a	Escondido	Spooks Canyon
Pacific Cut Stone & Granite Co.	a	414 S. Marengo Ave., Alhambra	Escondido
Sonoma County			
S. Cabrol	b, c	Glen Ellen	Glen Ellen

a. Granite used in building and monumental stone. b. Tuff used as building stone. c. Volcanic rock used as flagstone and building stone.

GYPSUM

Operator	Address	Location of quarry
Alameda County		
Westvaco Chlorine Prod. Corp.*	Newark	Newark
Imperial County		
Imperial Gypsum Quarry, Pacific Portland Cement[a]	417 Montgomery St., San Francisco	Plaster City
Vesubio Mining Corp., Ltd., Louis F. Vremsak	Calexico	Seeley
Kern County		
Jennie E. Daly, Koehn Gypsum Plant	Cantil	Saltdale
H. M. Holloway	Box 310, Lost Hills	Lost Hills
Monterey County		
Monterey Gypsum Co., H. B. Scott	P.O. Box 900, Watsonville	Kings City
Riverside County		
United States Gypsum Co.	300 W. Adams St., Chicago 6, Illinois	Midland
Ventura County		
A. H. Lange	Box 194, Tehachapi	Cuyama Valley
Monolith Portland Cement Co.	Bartlett Bldg., Los Angeles	Cuyama Valley

* Output not included in production figures as gypsum is by-product of chemical process using minerals already included in state total.
[a] Sold to United States Gypsum Co.

IODINE

Operator	Address	Mine
Los Angeles County		
Deepwater Chemical Co., Ltd.	Box 588, Compton	Compton
The Dow Chemical Co.	Midland, Mich.	Long Beach and Venice

IRON

Operator	Address	Location of mine
Riverside County		
Mineral Materials Co.	1145 Westminister Ave., Alhambra	Desert Center
San Bernardino County		
Kaiser Co., Inc., Iron and Steel Division	P.O. Box 217, Fontana	Kelso
Santa Cruz County		
Santa Cruz-Nevada Co.	1999 Bryant St., San Francisco	Aptos
Shasta County		
Shasta Iron, Carrico & Bautier	365 Ocean Ave., San Francisco	Heroult

LEAD

Principal Lead Producers in California in 1945 (Not Less Than 10,000 Pounds

Mine	Operator	Address	Post office of mine
Butte County			
Big Bend	Hoefling Bros.	1820 D St., Sacramento	Oroville
Calaveras County			
Penn	Miller & Clemson	4800 Santa Fe Ave., Los Angeles	Campo Seco
Inyo County			
Big Four	Silas Ness	Barstow	Keeler
Cerro Gordo	L. D. Foreman & Co.	850 S. 4th West St., Salt Lake City, Utah	Trona
Columbia No. 2	Finley Co.	Tecopa	Tecopa
Darwin Group	Anaconda Copper Mining Co.	Box 58, Darwin	Darwin
Gold Bottom and Ophir	Damon & Damon	Box 726, Trona	Trona
Last Chance	L. D. Foreman & Co.	850 S. 4th West St., Salt Lake City, Utah	Trona
Modoc	L. D. Foreman & Co.	850 S. 4th West St., Salt Lake City, Utah	Trona
Reward (Brown Monster)	T. L. Bright	Owenyo	Owenyo
Mariposa County			
Blue Moon	Red Cloud Mines, Inc.	Hornitos	Hornitos
San Bernardino County			
Burcham	J. L. and Foss Osborne	Olancha	Daggett
Lady Luck	James E. Boland	Cima	Cima
Mohawk	Dunton-Ray & Greenwood	Ivanpah	Ivanpah
New Sutherland Divide	New Sutherland Divide Mining Co.	Manix via Yermo	
Shasta County			
Afterthought	Jordan & Glennan	Redding	Ingot
Hornet (Mattie Orebody)	The Mountain Copper Co., Ltd.	216 Pine St., San Francisco	Matheson

LIME AND LIMESTONE

Operator	Product	Address	Location of quarry
Alameda County			
Westvaco Chlorine Prod. Corp.	a, d	Newark	Newark
Amador County			
A. Teichert & Son, Inc.	b	1846 37th St., Sacramento	Sutter Creek
El Dorado County			
Diamond Springs Lime Co.	a, b, c	Diamond Springs	Diamond Springs
El Dorado Limestone Co., J. H. Bell, Pres.	b	Shingle Springs	Shingle Springs
Inyo County			
Blue Star Mines, Ltd.	b	Room 510, 810 S. Spring St., Los Angeles	Zurich
Riverside County			
Magstone Products, Howard Small	b, c	Rt. 5, Box 50, Riverside	Riverside
San Bernardino County			
Cal. Portland Cement Co.	a, b	601 W. Fifth St., Los Angeles	Colton
Chubbuck Lime Co., Chas. I. Chubbuck	a, b, c	5000 Worth St., Los Angeles	Chubbuck
Marter Mining Co.	b	530 W. Sixth St., Los Angeles	Lucerne Valley
Victorville Lime Rock Co.	b	728 S. Bristol, Los Angeles	Victorville
San Luis Obispo County			
San Miguel Lime & Development Co.	b	Merchants Exchange Bldg., San Francisco	San Miguel
San Mateo County			
Pacific Portland Cement Co.	c, d	417 Montgomery St., San Francisco	Redwood City
Santa Clara County			
Bay Shell Co.	c, d	503 Market St., San Francisco	Alviso
Beck Dredging Co.	c, d	305 Parrott Dr., San Mateo	Alviso
Permanente Cement Co.	b	Permanente	Permanente
Santa Cruz County			
Henry Cowell Lime and Cement Co.	a, b	2 Market St., San Francisco	Santa Cruz
Pacific Limestone Prod. Co.	b, c	Spring St., Santa Cruz	Santa Cruz
Siskiyou County			
Mt. Shasta Lime Co., M. C. Lininger & Sons	b	Medford, Ore.	Gazelle
Tuolumne County			
Walter C. Sundburg	b	Box 653, Sonora	Sonora
U. S. Lime Products Corp.	a, b, c	58 Sutter St., San Francisco	Sonora
Ventura County			
Western Lime Products Co.	b, c	6305 Yucca St., Los Angeles	Santa Susana

a. Producer of burnt lime. b. Producer of limestone. c. Agricultural lime. d. Shells.

LITHIA

Operator	Address	Location of mine
San Bernardino County		
American Potash & Chemical Corp.	Trona	Trona

MAGNESITE

Operator	Address	Location of mine
Alameda County		
Westvaco Chlorine Prod. Corp.*	405 Lexington Ave., New York, N. Y.	Newark
Santa Clara County		
Westvaco Chlorine Prod. Corp., Lessee, Western Magnesite Mine	405 Lexington Ave., New York, N. Y.	Red Mountain

* Magnesite calcined only.

MAGNESIA AND OTHER MAGNESIUM COMPOUNDS

Operator	Product	Address	Location of plant
Alameda County			
Westvaco Chlorine Prod. Corp.	Basic carbonate	405 Lexington Ave., New York, N. Y.	Newark
Monterey County			
The Permanente Metals Corp.	Oxide	Permanente	Moss Landing
San Diego County			
Westvaco Chlorine Prod. Corp.	Chloride	405 Lexington Ave., New York, N. Y.	San Diego
San Mateo County			
Marine Magnesium Prod. Corp., R. E. Clarke	Carbonate hydroxide and oxide	South San Francisco	South San Francisco
Plant Rubber; Asbestos Works	Carbonate	537 Brannan St., San Francisco	Redwood City

MANGANESE ORE

Principal Producers Out of 12 Shipping Properties

Operator	Address	Location of mine
Humboldt County		
Fort Baker Mine, James I Scott & Co.	P.O. Box 624, Fortuna	Showers Pass
Marin County		
L. R. Knutte	Nave Bldg., Novato	Novato
Riverside County		
Arlington Group, A. B. Miner	11143 Washington Blvd., Culver City	Inca
San Bernardino County		
Kern Leasing Co., Howard W. Orwig	1079½ Leighton Ave., Los Angeles	Barstow
San Joaquin County		
Johnson Manganese Mining Co.	1007 Merchants Exchange Bldg., San Francisco	Vernalis
San Luis Obispo County		
Irish Hill Manganese Mine, Henry DeLacci	San Luis Obispo	San Luis Obispo
Trinity County		
Blue Jay & Lost Mines, J. P. Warren	605 Market St., San Francisco	Fort Seward

MICA

Operator	Product	Address	Location of mine
Imperial County			
Western Non-metallic Co., C. F. Allebrand	a	Ogilby	Ogilby

a. Sericite mica schist.

MINERAL PAINT

Operator	Address	Location of property
San Bernardino County		
Rowe & Buehler	1555 Sunset Ave., Pasadena	Lavic

MINERAL WATER

Operator	Address	Location of spring
Butte County		
Richardson Mineral Springs	Richardson Springs	Richardson Springs
Calaveras County		
Mok-Hill Mineral Springs Seven Up Bottling Co.	2512 Broadway, Sacramento 17	Mokelumne Hill
Contra Costa County		
Alhambra Water Co.	Martinez	Martinez
Fox Water Co.	675 37th St., Oakland	Oak Springs
Lake County		
Adams Mineral Springs	Adams, via Middletown	Adams
Bartlett Springs	Bartlett Springs, via Williams	Bartlett Springs
Norman Mineral Springs, H. C. Norman, Mgr.	Middletown	Middletown
Witter Medical Springs, W. E. Whitaker	1265 Fourth Ave., San Francisco	Witter Springs
Los Angeles County		
Deep Rock Artesian Water	4416 York Blvd., Los Angeles	Los Angeles
Elysian Spring Water Co.	1536 Baxter, Los Angeles	Los Angeles
Frespuro Artesian Water	4430 York Bldg., Los Angeles	Los Angeles
Holly Spring Water	2298 Holly Dr., Los Angeles	Los Angeles
Indian Head Mineral Water	3640 N. Griffin Ave., Los Angeles	Los Angeles
Magnetic Spring Water Co.	939 Palm Ave., Sherman	Los Angeles
Mountain Spring Water Co.	226 S. Avenue 54, Los Angeles	Los Angeles
Sparklett Bottled Water Corp.	4500 York Blvd., Los Angeles	Los Angeles
Marin County		
Purity Spring Water Co.	2032 Kearny St., San Francisco	
Napa County		
Calistoga Bottling Works, Ernest Mainini	Calistoga	Calistoga
Napa Soda Co.	c/o Marin C. Matosich, Flood Bldg., San Francisco	Napa
Samuels Soda Springs, T. B. Grigsby	Monticello	Monticello

MINERAL WATER—Continued

Operator	Address	Location of spring
Riverside County		
Beulah Springs, Oscar C. McNicholl	Arlington	Arlington
San Bernardino County		
Arrowhead & Puritas Waters, Inc.	1566 E. Washington Blvd., Los Angeles	Arrowhead
San Diego County		
Rock Springs Co., L. H. Walck	Route 2, Box 224-A, Escondido	Escondido
San Luis Obispo		
New Crystal Spring Water Co., Ellen M. Hudson	Route 2, Box 129, San Luis Obispo	San Luis Obispo
Shasta County		
Hilltop Spring Water Co.	Redding	Shasta
Siskiyou County		
Coca Cola Bottling Co., Fred J. Meamber, Prop.	Yreka	Little Shasta
The Shasta Water Co.	Sixth and Brannan Sts., San Francisco	Dunsmuir
Sonoma County		
Agua Caliente Springs Co., Francis B. Cox	Agua Caliente	Agua Caliente
Barcal Springs, John Kolling	Cloverdale	Cloverdale

MOLYBDENUM ORE

Mine	Operator	Address	Location of mine
Inyo County			
Pine Creek Mine	*United States Vanadium Corp.	Bishop	Bishop

* Expects to resume production in 1946.

PLATINUM

Operator	Address	Location of mine
Merced County		
Merced Dredging Co.*	Mills Bldg., San Francisco	Snelling
Sacramento County		
Natomas Co.	Forum Bldg., Sacramento	Natoma
Stanislaus County		
Tuolumne Gold Dredging Co.	La Grange	La Grange
Trinity County		
Junction City Mining Co.*	Junction City	Junction City
Yuba County		
Yuba Consolidated Gold Fields*	351 California St., San Francisco	Hammonton

* Platinum metals not sold in 1945.

POTASH

Operator	Address	Location of plant
San Bernardino County		
American Potash and Chemical Co.	Trona	Trona

PUMICE AND VOLCANIC ASH

Operator	Product	Address	Location of property
Contra Costa County			
Diablo Pumibloc Co., Gieg Bros.	a	Rt. 1, Box 317, Pittsburg	Pittsburg
Furman, Gieg, & Vierra	a	Rt. 2, Box 759, Pittsburg	Pittsburg
Inyo County			
Pacific Coast Pumice Co., C. W. Churchill	a	P.O. Box 656, Bishop	Bishop
Western Talc Co.	a	1901 E. Slauson Ave., Los Angeles	Shoshone
Kern County			
Calsilico Corp., G. A. Reynolds	b	445 S. Amalia Ave., Los Angeles	Cantil
Cudahy Packing Co.	b	803 Macy St., Los Angeles	Ceneda
Madera County			
Calif. Industrial Minerals, c/o Forrest S. Taylor	b	Friant	Friant
Elmer Erickson	b	Friant	Friant
Pacific Pumice Materials Co., W. E. Schlink	a	1047 N. Hunter St., Stockton	Friant
Modoc County			
Glass Mt. Volcolite Co., H. W. Free	a	Tionesta	Tionesta
Timber Mountain Pumice Products	a	Tionesta	Tionesta
Mono County			
U. S. Pumice Supply Co.	a	1320 Corporation Bldg., Los Angeles	Laws
W. R. Woock	a	639 E. Lockford St., Lodi	Laws
Napa County			
Basalt Rock Co.	a	Eighth St., Napa	Napa
Siskiyou County			
Boorman Pumice Products, Clarence Boorman	a	Klamath Falls, Ore.	Tionesta
Glass Mountain Industries	c, d	P.O. Box 648, Klamath Falls, Ore.	Tionesta
Glass Mt. Volcolite Co., H. W. Free	a, c, d	Tionesta	Glass Mountain
Klamath Concrete Pipe Co.	a	Klamath Falls, Oregon	

a. Pumice aggregate. b. Volcanic ash. c. Scoria. d. Pumice for scouring brick.

PYRITE

Operator	Address	Location of mine
Shasta County		
Mountain Copper Co., Wm. F. Kett, Mgr.	216 Pine St., San Francisco	Matheson

Principal Producers in California for 1945 Out of a Total of 43 Operating Properties

Mine	Operator	Address	Location of mine
Contra Costa County			
Mt. Diablo	Bradley Mining Co.	Crocker Bldg., San Francisco	Clayton
Del Norte County			
Webb	Oscar E. & Ed. Hanno	Crescent City	Patricks Creek
Inyo County			
Coso	King Mining Co., Lloyd King	Little Lake	Little Lake
Lake County			
Abbott	International Metals Dev. Inc., C. O. Reed, Mgr.	Williams	Wilbur Springs
Helen	Scott Kline & L. S. Peterson	Middletown	Middletown
Mirabel*	Mirabel Quicksilver Co.	Middletown	Middletown
Sulphur Bank	Bradley Mining Co.	Crocker Bldg., San Francisco	Clearlake Park
Napa County			
Eureka	A. Garcia	Box 513, Middletown	Pope Valley
Knoxville	Geo. E. Gamble (Owner)	1431 Waverly St., Palo Alto	Monticello
San Benito County			
New Idria	New Idria Quicksilver Mining Co.	Mills Bldg., San Francisco	Idria
Stayton Quicksilver	R. B. Knox	Hollister	Hollister
San Luis Obispo County			
Buena Vista	Virgil Smith	Paso Robles	Paso Robles
Santa Clara County			
Guadalupe	Laco Mining Co., H. N. Mason	Rt. 3, Box 412, Los Gatos	Los Gatos
New Almaden	New Almaden Corp., C. N. Schuette, Gen. Mgr.	204 Sharon Bldg., San Francisco	Almaden
New Almaden Dump	Dave & Ben Black (owners)	5050 Fulton St., San Francisco	Almaden
Sonoma County			
Culver Baer	C. A. Baumeister	Cloverdale	Cloverdale
Dewey's	Frank Dewey	Cloverdale	Geysers
Mt. Jackson	Sonoma Quicksilver Mines, Inc.	58 Sutter St., San Francisco	Guerneville
Trinity County			
Altoona	Marsman Co. of California	Russ Bldg., San Francisco	Castella
Yolo County			
Reed	Bradley Mining Co.	Crocker Bldg., San Francisco	Rumsey

* Closed down November 1945.

SALT

Operator	Address	Location of plant
Alameda County		
American Salt Co.	341 Broadway, San Francisco	Mt. Eden
Leslie Salt Co.	310 Sansome St., San Francisco	Newark and Mt. Eden
Oliver Bros. Salt Co.	Mt. Eden	Mt. Eden
Kern County		
Long Beach Salt Co.	P.O. Box 28, Long Beach	Saltdale
Inyo County		
Minerals Materials Co., J. W. Dunton, Mgr.	1145 Westminster Ave., Alhambra	Badwater
Los Angeles County		
Long Beach Salt Co.	P.O. Box 28, Long Beach	Long Beach
Mono County		
C. C. Miller	837 W. Los Angeles St., Baldwin Park	Mono Lake
Monterey County		
Monterey Bay Salt Works, E. C. Vierra, Mgr.	Moss Landing	Moss Landing
Orange County		
The Irvine Co.	Tustin	Tustin
San Bernardino County		
California Rock-Salt Co.	2465 Hunter St., Los Angeles	Amboy
Desert Chemical Co.	4031 Goodwin Ave., Los Angeles	Amboy
San Diego County		
Western Salt Co.	1245 National Ave., San Diego	San Diego

SANDSTONE

Operator	Product	Address	Location of quarry
Monterey County			
Carmel Stone Quarry, A. L. Possadori	b	Box 185, Carmel	Carmel
Andrew Stewart	b	Carmel Valley	Carmel
Napa County			
H. F. Galbreath	a	940 Regal Rd., Berkeley 8	----------
Ventura County			
Ritchie Bros., R. A. Ritchie	c	Fillmore	Grimes Canyon

a. Sandstone. b. Carmel stone. c. Red shale.

SILVER

Principal Silver Producers in California in 1945

Mine	Type of mine	Operator	Address	Post office of mine
Amador County				
Newton	j	Winston Copper Co.	Subway Terminal Bldg., Los Angeles	Ione
Butte County				
Big Bend	o	Hoefling Bros.	1820 D St., Sacramento	Oroville
Calaveras County				
Penn	o	Miller and Clemson	4800 Santa Fe Ave., Los Angeles	Campo Seco
Inyo County				
Columbia No. 2	m	Finley Co.	Tecopa	Tecopa
Darwin Group	p	Anaconda Copper Mining Co.	Box 58, Darwin	Darwin
Modoc	m	L. D. Foreman & Co.	850 S. Fourth West St., Salt Lake City, Utah	Trona
Mariposa County				
Blue Moon	o	Red Cloud Mines, Inc.	Hornitos	Hornitos
Nevada County				
Empire, North Star, et al.	a	Empire Star Mines Co., Ltd.	Grass Valley	Grass Valley
Idaho, Maryland and New Brunswick	a	Idaho Maryland Mines Corp.	Russ Bldg., San Francisco	Grass Valley
----------	c	Jordan & Glennan	Nevada City	----------
Orange County				
Silverado	p	Blue Light Silver Mines Co.	508 Chapman Bldg., Fullerton	Orange
San Bernardino				
Mohawk	p	Dunton-Ray & Greenwood	Ivanpah	Ivanpah
Roosevelt	a	Donald F. Love	Ludlow	Ludlow
Shasta				
Afterthought	s	Jordan & Glennan	Redding	Redding
Hornet (Mattie Orebody)	s	The Mountain Copper Co., Ltd.	216 Pine St., San Francisco	Matheson
Siskiyou County				
Dakin (Gray Eagle)	j	Gray Eagle Copper Co.	Yreka	Happy Camp

a. Lode Gold mine. b. Gold-silver mine. c. Tailings dumps. j. Copper-gold mine. m. Lead mine. o. Zinc mine. p. Silver-lead-zinc. s. Copper-zinc mine.

SILICA

Operator	Product	Address	Location of mine
Contra Costa County			
Pittsburg Sand Co.	b	87th and G Sts., Oakland	Summerville
Monterey County			
Del Monte Properties	b	Del Monte	Pacific Grove
Owens-Illinois Glass Co.	b	135 Stockton St., San Francisco	Pacific Grove
Riverside County			
Owens-Illinois Glass Co.	b	P.O. Box 298, Corona	Corona
P. J. Weisel, Inc.*	b	La Habra	Corona
San Bernardino County			
Mineral Materials Co., C. W. Dunton, Mgr.	a	1145 Westminster Ave., Alhambra	
San Diego County			
Crystal Silica Co.	b	717 E. 61st St., Los Angeles	Oceanside

a. Quartz. b. Glass sand. c. Quarzite.
* Taken over by Owens-Illinois Glass Co., October 1, 1945.

SILLIMANITE-ANDALUSITE-KYANITE GROUP

Operator	Product	Address	Location of mine
Imperial County			
Vitrefrax Co.	Kyanite	5050 Pacific St., Vernon, Los Angeles	Ogilby
Mono County			
Champion Sillimanite, Inc.	Andalusite	Box 117, Laws	Mocalno

SLATE

Operator	Product	Address	Location of quarry
El Dorado County			
Pacific Minerals Co., Ltd.	b, c	337 10th St., Richmond	Chili Bar
Placer County			
J. R. Hodgson	a	Box 88, Colfax	Colfax

a. Facing. b. Granules. c. Crude.

SOAPSTONE AND TALC

Operator	Product	Address	Location of mine
El Dorado County			
Pacific Minerals Co., Ltd.	a	337 10th St., Richmond	Shingle
Inyo County			
Blue Star Mines, Ltd.	b	810 S. Spring St., Los Angeles	Kingston Mountain
Desert Talc & Clay Co.	b	Pomona	Keeler
Sierra Talc Co.	b	724 S. Spring St., Los Angeles 14	Keeler
White Mountain Talc Co., Wm. M. Bonham	b	Lone Pine	Lone Pine
Mono County			
Huntly Mines	b, c	P.O. Box 485, Bishop	Laws
San Bernardino County			
Monarch Talc Mines	b	649 S. Olive St., Los Angeles	Shoshone
Sierra Talc Co.	b	724 S. Spring St., Los Angeles	Silver Lake
Southern Calif. Minerals Co., W. S. Skeoch	b	320 Mission Rd., Los Angeles	Superior, Calmasil, & Kingston Mountain
Western Talc Co.	b	1901 E. Slauson Ave., Los Angeles	Death Valley
San Diego County			
Pioneer Pyrophyllite Prod., B. F. Matthews	c	1124 Commonwealth Ave., Hollywood	Rancho Santa Fe
Tuolumne County			
Walter C. Sundburg	a	Box 653, Sonora	Sonora

a. Soapstone. b. Talc. c. Pyrophyllite.

SODA

Operator	Product	Address	Location of plant
Inyo County			
Natural Soda Products, Co.	a, d	405 Montgomery St., San Francisco	Keeler
Pittsburgh Plate Glass Co., Columbia Chemical Division	a, d	Bartlett	Bartlett
San Bernardino County			
American Potash & Chemical Co.	a, c	Trona	Trona
Desert Chemical Co.	c	4031 Goodwin Ave., Los Angeles	Amboy
West End Chemical Co.	a	Latham Square Bldg., Oakland	West End

a. Soda ash. c. Salt cake. d. Trona.

STONE, MISCELLANEOUS

Under the heading of 'miscellaneous stone' there are four divisions—crushed rock, grinding mill pebbles, paving blocks, and sand and gravel. Crushed rock includes crushed rock that is used in macadam, ballast and for concrete; also rock used for rubble and riprap.

NOTE—The California State Highway Commission, the various counties, U. S. Forest Service and U. S. Bureau of Public Roads produce both crushed rock and sand and gravel in various places in the State used in construction and maintenance of highways, but not specified in this listing.

Operator	Product	Address	Location of pit or quarry
Alameda County			
Louis Angelus	b	604 McArthur Blvd., San Leandro	Oakland
California Rock & Gravel Co.	a	1800 Hobart Bldg., San Francisco	Livermore
J. Catucci	b	1212 18th Ave., Oakland	Oakland
Heafey-Moore Co., Leona Quarry	b	344 High St., Oakland	Oakland
Henry J. Kaiser Co.	a, b	Kaiser Bldg., 1924 Broadway, Oakland	Radum
Leslie Salt Co.	b	310 Sansome St., San Francisco	Newark
J. L. Martin	b	5921 Shepherd Canyon Rd., Oakland	Oakland
Pacific Coast Aggregates, Inc.	a, b	85 2d St., San Francisco	Eliot and Niles
Thos. B. Russell Quarry, T. B. Russell	b	1192 Russell Way, Hayward	Hayward
San Leandro Rock Co.	a, b	1150 Estudillo Ave., San Leandro	Lake Chabot
Superior Rock Co.	b	Broadway and McAdams St., Oakland	Oakland
Butte County			
Henry J. Kaiser Co.	a, b	1924 Broadway, Oakland	Oroville
Pacific Coast Aggregates, Inc.	a	85 Second St., San Francisco	Oroville
Pacific Gas & Electric Co.	b	245 Market St., San Francisco	----------
Calaveras County			
Neilsen Gravel Plant, R. Neilsen	a	Box 14, San Andreas	San Andreas
Contra Costa County			
Antioch Asphalt Co.	a	Claremont Hotel, Berkeley 5	Antioch
Atchison, Topeka & Santa Fe Railway Co.	g	121 E. Sixth St., Los Angeles 14	----------
Basalt Rock Co.	a	Eighth St., Napa	Antioch
Blake Bros., Anson Blake	b	Box 1002, Richmond	Point Richmond
Henry J. Kaiser Co.	a, b	1924 Broadway, Oakland	Antioch and Upton
Morris Sand Pit, Ben Morris	a	Antioch	Antioch
The Roberts Bros.	c	Pittsburg	Clayton
El Dorado County			
Diamond Springs Lime Co.	b	Diamond Springs	Diamond Springs
Fresno County			
Atchison, Topeka & Santa Fe Railway Co.	b, g	121 E. Sixth St., Los Angeles 14	----------
Central Rock & Sand Co.	a, b	Sanger	Sanger
Grant-Pacific Rock Co.	a	Box 649, Fresno	El Prado
Herndon Rock Products Co.	a, b	410 Thorne St., Fresno	Herndon
Southern California Edison Co.	a, b	Edison Bldg., Los Angeles 53	----------

Glenn County			
E. B. Bishop	a	Box 325, Orland	Wyo
Southern Pacific Co.	a	65 Market St., San Francisco	Wyo
Humboldt County			
Tom Hull	b	Eureka	Eureka
Mercer Fraser Co., Essex & Fernbridge	a	Second and Commercial Sts., Eureka	Eureka
Northwestern Pacific R.R. Co.	a	San Rafael	Sequoia
Imperial County			
Donald Cowan	a	El Centro	El Centro
Lucien E. Smith Pipe Yard	a	Rt. 2, Box 270, El Centro	Seeley
Kern County			
Bakersfield Rock and Gravel Co.	a	Box 395, Station A, Bakersfield	Bakersfield
Southern California Edison Co., Ltd.	a, b	Edison Bldg., Los Angeles 53	
Los Angeles County			
Arrow Rock Co.	a	Box 155, Monrovia	Monrovia
A. T. & S. F. R.R., I. L. Hibbard, Gen. Mgr.	a	121 E. Sixth St., Los Angeles 14	Forbes
Guy F. Atkinson Co.	b	1103 Heartwell Bldg., Long Beach 2	Santa Catalina Island, Long Point
Azusa Rock & Sand Co.	a, b	Rural Delivery, Azusa	Azusa
Richard R. Ball	a	Box 96, Walteria	Walteria
Blue Diamond Corp., Ltd.	a	1650 S. Alameda St., Los Angeles	El Monte and Roscoe
Wm. J. Bonfield	g	2008 Laurel Canyon Rd., Los Angeles	Hollywood
Chandler Palos Verdes Sand & Gravel, L. Chandler	a	Lomita	Lomita
City Rock Co.	a	Box A, Sunland	Sunland
Consolidated Rock Produce Co.	a, b	Box 2950 Terminal Annex or 2730 S. Alameda St., Los Angeles	Los Angeles, Azusa, Roscoe and Monrovia
W. F. Glaser, Inc.	b	13573 Romany Dr., Pacific	Brentwood Heights
John D. Gregg	a, b	Box 110, Whittier	Whittier
Lindauer Corp.	a	Box 208, La Habra	La Habra
Los Angeles Decomposed Granite Co.	g	2171 W. Washington, Los Angeles	Los Angeles
Manning Bros. Rock & Sand Co.	a, b	Irwindale	Irwindale
Mission Rock & Sand Co.	a	1172 La Presa Dr., San Gabriel	San Gabriel
Owl Rock Products Co.	a, b, g	P.O. Box 509, Monrovia	Monrovia
Pacific Rock & Gravel Co.	a, b	800 Lane Mortgage Bldg., 208 W. Eighth St., Los Angeles	
Edwin Sidebotham & Sons, Sidebotham Sand Plant	a	McFarland and L Sts., Wilmington	Lomita
Marin County			
Basalt Rock Co.	b	Eighth St., Napa	McNear Point
Hutchinson Co.	b	Box 156, El Cerrito	San Quentin
Marin Gravel Co.	a	Point Reyes	Point Reyes
Mariposa County			
Yosemite National Park	a	Yosemite	Yosemite Nat'l Park
Mendocino County			
John Freitas	a, b	Ukiah	Ukiah

a. Sand and gravel. b. Crushed rock (macadam, ballast, rubble, riprap, etc.). c. Molding sand. d. Granules for roofing, terrazzo. e. Slag and volcanic cinder. f. Tube-mill pebbles. g. Decomposed granite.

STONE, MISCELLANEOUS—Continued

Under the heading of 'miscellaneous stone' there are four divisions—crushed rock, grinding mill pebbles, paving blocks, and sand and gravel. Crushed rock includes crushed rock that is used in macadam, ballast and for concrete; also rock used for rubble and riprap.

NOTE—The California State Highway Commission, the various counties, U. S. Forest Service and U. S. Bureau of Public Roads produce both crushed rock and sand and gravel in various places in the State used in construction and maintenance of highways, but not specified in this listing.

Operator	Product	Address	Location of pit or quarry
Merced County			
Bair Creek Sand and Gravel Co., J. W. Huffman	a, b	Merced	
J. C. Halbert	a	Winton	Winton
Los Banos Gravel Co.	a	Los Banos	Los Banos
Modoc County			
Great Northern Railway, T. A. Jerrow, Supt.	e	Klamath Falls, Ore.	Mammoth
Moyer Gravel Co.	a, b	P.O. Box 25, Alturas	Alturas
Monterey County			
Del Monte Properties, C. S. Olmsted	a, c	Del Monte	Del Monte
Monterey Sands, Irving Kelly	a	Marina	Marina
M. J. Murphy	a, b	Monte Verde and Ninth Sts., Carmel	Carmel
Pacific Coast Aggregates, Inc.	a	85 Second St., San Francisco	Lapis and Pratteo
Napa County			
Basalt Rock Co.	b	Eighth St., Napa	Napa
Juarez Quarry, M. G. Reidenbach	b	Napa	Napa
Orange County			
Geo. T. Calhoun	a	P.O. Box 1741, Santa Ana	Garden Grove
California Rock Co.	a	Rural Delivery, Orange	Orange
Consolidated Rock Products Co.	a, b	2730 S. Alameda St., Los Angeles	Fullerton and Orange
Foster Sand & Gravel Co.	g	915 S. Spadra Rd., Fullerton	Fullerton
Fowler Sand & Gravel Co.	a	Rt. 1, Box 19-A, Orange	Santa Ana
V. J. Frye Foundry Supplies	c	1302 N. Flower St., Santa Ana	Santa Ana
D. D. Lawhead	g	Seal Beach	Seal Beach
Placer County			
Union Granite Co., Ruhkala Bros.	b	Rocklin	Rocklin
Riverside County			
Guy F. Atkinson Co.	b	1103 Heartwell Bldg., Long Beach	Bly Junction
A. T. & S. F. R.R. Co., I. L. Hibbard, Gen. Mgr.	b	121 E. Sixth St., Los Angeles 14	Box Springs
Emil Johnson	b	Perris	Perris
Mission Indians	a	Palm Springs	Palm Springs
San Gorgonio Rock Co.	a, b	Banning	Banning
A. E. Scwabacher	g	610 Market St., San Francisco	
Service Rock Co.	a	Box 309, Riverside	Riverside
Transit Mixed Concrete Co.	a, b	3464 E. Foothill Blvd., Pasadena	Corona
P. J. Weisel, Industrial Sands[1]	a, c, h	La Habra	Corona

Sacramento County			
Brighton Sand & Gravel Co.	a, b	P.O. Box 2604, Sacramento	Sacramento
Canon & Co.	c	Box 281, Sacramento	Ben Ali
Del Paso Rock Products Co.	a, b	Rt. 5, Box 1200, Sacramento	Del Paso
Fair Oaks Gravel Co.	a	Illinois Ave., Fair Oaks	Fair Oaks
Lord & Bishop	b	P.O. Box 812, Sacramento 4	Sacramento
Pacific Coast Aggregates, Inc.	a, b	85 Second St., San Francisco	Fair Oaks, Mayhew and American River
Perkins Gravel Co.	a, b	Perkins	Perkins
Robert Powell & Co.	a	Box 815, Sacramento	American River
San Benito County			
Granite Rock Co.	b	Drawer M, Watsonville	Logan
San Bernardino County			
A. T. & S. F. R.R.	a, b	600 Kerckhoff Bldg., Los Angeles	Gale
Concrete Rock & Sand Co.	a	P.O. Box 149, Colton	Colton
Consolidated Rock Products Co.	a, b	2730 S. Alameda St., Los Angeles	Claremont
Geo. Herz & Co.	a	Base Line & Lytle Sts., San Bernardino	San Bernardino
Holiday Rock Co.	a	Upland	Upland
Palm Springs Builders' Supply Co.	a, b	682 S. Palm Canyon Dr., Palm Springs	Palm Springs
Redlands Gravel Co.	a	Redlands	Redlands
San Bernardino Rock & Gravel Co.	a	Box 249, San Bernardino	San Bernardino
Triangle Rock & Gravel Co.	a	San Bernardino	San Bernardino
Union Pacific Railroad Co.	a	2025 Hunter St., Los Angeles	Baxter
San Diego County			
Canyon Rock Co.	a, b	Box F, Hillcrest Sta., San Diego	San Diego
Claudell & Johnson	a	Box 246, Hillcrest Sta., San Diego	Mission Valley
Crystal Silica Co.	a, c, h	717 E. 61st St., Los Angeles	Oceanside
Daley Corp., Geo. Daley	a	4430 Boundary St., San Diego	San Diego
Escondido Sand & Gravel Works	a	Escondido	Escondido
H. G. Fenton Materials Co.	a	13th and Imperial Ave., San Diego	San Diego
H. M. Hubbard	c	2700 Barnson Pl., San Diego	San Diego
Lawrence Rock Co.	a, b	Oceanside	Oceanside
John T. Momand	f	P.O. Box 381, Carlsbad	Carlsbad
Nelson & Sloan	a	Box 832, Chula Vista	Chula Vista
Oceanside Rock & Sand Co.	a	Oceanside	Oceanside
San Francisco County			
Mission Quarry Co.	b	210 Balboa Bldg., San Francisco	San Francisco
San Joaquin County			
Frank B. Marks & Sons	a, b	203 Berverdor, Tracy	Tracy
Mokelumne Sand & Gravel Co., D. M. Dyer	a	527 E. Lodi Ave., Lodi	Lodi
Pacific Coast Aggregates, Inc.	a, b	85 Second St., San Francisco	Riverbank
Putnam Sand & Gravel Co.	a	P.O. Box 486, Modesto	Riverbank
Santa Fe Sand & Gravel Co., W. A. Arlington	a	Box 271, Escalon	Escalon

[1] Taken over by Owens-Illinois Glass Co. on October 1, 1945.

a. Sand and gravel. b. Crushed rock (macadam, ballast, rubble, riprap, etc.). c. Molding sand. d. Granules for roofing, terrazzo. e. Slag and volcanic cinder. f. Tube-mill pebbles. g. Decomposed granite. h. Filter and glass sand.

STONE, MISCELLANEOUS—Continued

Under the heading of 'miscellaneous stone' there are four divisions—crushed rock, grinding mill pebbles, paving blocks, and sand and gravel. Crushed rock includes crushed rock that is used in macadam, ballast and for concrete; also rock used for rubble and riprap.

NOTE—The California State Highway Commission, the various counties, U. S. Forest Service and U. S. Bureau of Public Roads produce both crushed rock and sand and gravel in various places in the State used in construction and maintenance of highways, but not specified in this listing.

Operator	Product	Address	Location of pit or quarry
San Luis Obispo County			
Guiton Molding Sand, Harold E. Guiton	c	Oceano	Oceano
Walter B. Roselip	a	615 Grand Ave., San Luis Obispo	Atascadero
San Mateo County			
Brumley-Donaldson Co.	c	Rialto Bldg., San Francisco	South San Francisco
Canadas Quarry, California Paving Co.	b	1406 Third Ave., San Mateo	Half Moon Bay
Tex Donovan	b	P.O. Box 381, Redwood City	Woodside
Golden West Quarry	b	Geneva Ave. and Santos St., San Francisco 24	Daly City
Holy Cross Cemetery	b	Colma	Colma
Rockaway Quarry, Inc.	a, b	Rockaway Beach	Rockaway Beach
Ken Royce	b	185 Bayshore Blvd., San Francisco	Rockaway Beach
Shoreland Co.	b	Pescadero	Pescadero
W. O. Tyson	b	345 Hilton, Redwood City	Belmont
Santa Barbara County			
Miller Bros. Truck Co.	c	10424 Washington Ave., South Gate	Goleta
Henry G. Petersen, d.b.a. Buell Flat Rock Co.	b	Solvang	Solvang
Southern Pacific R.R. Co., Ass't Chief Engineer	b	Southern Pacific Bldg., San Francisco	Arlight
Santa Clara County			
Los Gatos Sand and Gravel Co.	a	Los Gatos	Los Gatos
Pacific Coast Aggregates, Inc.	a, b	85 Second St., San Francisco	Coyote and Campbell, San Jose
Permanente Cement Co.	b	Permanente	Permanente
A. J. Raisch Paving Co.	a	900 W. San Carlos St., San Jose	San Jose
Rhodes & Robinson, Stanford Quarry	b	Box 325, Palo Alto	Palo Alto
Santa Cruz County			
Henry J. Kaiser Co.	a	1924 Broadway, Oakland	Olympia
Pacific Coast Aggregates, Inc.	a	85 Second St., San Francisco	Olympia
Shasta County			
Oaks Gravel Plant, G. E. Oaks	a	1341 Yuba St., Redding	Redding
City of Redding	a, b	Redding	Redding
Southern Pacific R.R. Co., Ass't Chief Engineer	e	Southern Pacific Bldg., San Francisco	Kennett
Siskiyou County			
A. E. Kottinger	b	Mt. Shasta	Mt. Shasta
Southern Pacific R.R. Co., Ass't Chief Engineer	e	Southern Pacific Bldg., San Francisco	Kegg
A. Young	a	345 N. Main St., Yreka	Yreka

Solano County			
J. M. Nelson, Cordelia Quarry	b	Cordelia	Cordelia
Sonoma County			
Basalt Rock Co.	a	Eighth St., Napa	Healdsburg
C. A. Call	a	Fort Ross	Fort Ross
Hein Bros. Basalt Rock Co., Mark Hein, Pres.	b	Petaluma	Petaluma
John C. Spaletta	b	P.O. Box 442, Santa Rosa	Santa Rosa
Stony Point Quarry, W. A. Wilson	b	Petaluma, Star Route	Stony Point
Stanislaus County			
Tony Francisco	a	Crows Landing	Crows Landing
Wes Haslan	a, b	Oakdale	Oakdale
Hughson Gravel Co.	a	301 N. Santa Cruz Ave., Modesto	Hughson
Frank B. Marks & Sons	a	203 Berverdor St., Tracy	Newman
Oakdale Irrigation Dist.	a	Oakdale	Oakdale
J. P. Scanlon, Scanlon Gravel Pit	a	Patterson	Crows Landing
Chas. Warner	a	Modesto	Modesto
Tehama County			
Archie Draper & Floyd Adams	a	Red Bluff	Red Bluff
Trinity County			
Northwestern Pacific R.R. Co., Wm. N. Neff, Gen. Sup't	b	Sausalito	Island Mountain
Tulare County			
Grant-Pacific Rock Co.	a, b	P.O. Box 649, Fresno	Lindsay
O. C. Jeffers	a	1032 River Rd., Porterville	Porterville
Tuolumne County			
Beerman & Jones	b	Sonora	Soulsbyville
Ventura County			
Montalvo Rock Co.	a, b	Box 188, Montalvo	Montalvo
Santa Paula Rock Co.	a, b	Box 671, Santa Paula	Santa Paula
Saticoy Rock Products Co.	a, b	Box 970, Ventura	Saticoy-Ventura
Ventura Molding Sand Co., O. D. Messmore	c	182 W. Simpson St., Ventura	Ventura
Yolo County			
Wayne Armstrong	a	Woodland	Woodland
Leroy Kerr	a	Yolo	Yolo
Joe Schwarzgruber	a	Woodland	Woodland
George Summers	a	Woodland	Woodland
Yuba County			
Hemstreet & Bell	a, b	501 11th St., Marysville	Marysville
Pacific Coast Aggregates, Inc.	a	85 Second St., San Francisco	Marysville
Yuba River Sand Co.	a	Marysville	Marysville

a. Sand and gravel. b. Crushed rock (macadam, ballast, rubble, rip-rap, etc). c. Molding sand. d. Granules for roofing, terrazzo. e. Slag and volcanic cinder. f. Tube-mill pebbles. g. Decomposed granite.

STRONTIUM

Operator	Address	Location of mine
Imperial County		
Pan-Chemical Co., John A. Stevens	1396 N. Harvard St., Claremont	Fish Mtn.
San Bernardino County		
Rowe-Buehler Mining Co., Wesley N. Rowe	919 E. Valley Blvd., Rosemead	Lavic

TITANIUM

Operator	Address	Location of mine
Los Angeles County		
Mrs. Harvey R. Smith*	421 S. Harvard Blvd., Los Angeles	Hermosa Beach
Challoner Thompson*	San Canyon Rt. 1, Saugus	Saugus

* Expects to ship in 1946.

TUNGSTEN

Mine	Operator	Address	Location of mine
Alpine County			
----------	Alpine Mining Co.*	Fifth and Cottage, San Rafael	Markleeville
Fresno County			
----------	Consolidated Tungsten	Box 366, Dinuba	Drum Valley
Inyo County			
Papas & Schober	El Diablo Mining Co., H. O. Johanson, Mgr.	Box 567, Bishop	Tungsten City
Pine Creek	U. S. Vanadium Corp.	30 E. 42d St., New York, N. Y.	Bishop
Tungstar	Tungstar Corp., P. N. Stevens	6233 Hollywood Blvd., Los Angeles	Bishop
Kern County			
Hi Peak	U. S. Flare Corp., Mining Division	650 S. Grand Ave., Los Angeles	Inyokern
Mono County			
Black Rock	A. E., S. H., & John Beauregard	Bishop	Benton
San Bernardino County			
Spud Patch Placers and Atolia	Hoefling Bros.	1820 D St., Sacramento	Atolia
----------	Austin Lands	Randsburg	Randsburg
Tulare County			
Herberts	Herberts Mines	Rt. 5, Box 150-A, Porterville	Porterville

* Mined tungsten ore but made no shipments.

ZINC

Principal Producers of Zinc in California in 1945 (Not Less Than 10,000 Pounds)

Mine	Operator	Address	Post office of mine
Butte County			
Big Bend	Hoefling Bros.	1820 D St., Sacramento	Oroville
Calaveras County			
Penn	Miller and Clemson	4800 Santa Fe Ave., Los Angeles	Campo Seco
Inyo County			
Big Four	Silas Ness	Barstow	Keeler
Darwin Group	Anaconda Copper Mining Co.	Box 58, Darwin	Darwin
Gold Bottom & Ophir	Damon & Damon	Box 726, Trona	Trona
Kern County			
Black Hawk	Pacific-Atlantic Metals Corp.	Caliente	Caliente
Mariposa County			
Blue Moon	Red Cloud Mines, Inc.	Hornitos	Hornitos
Orange County			
Silverado	Blue Light Silver Mines Co.	508 Chapman Bldg., Fullerton	Orange
San Bernardino County			
Lady Luck	James E. Boland	Cima	Cima
Mohawk	Dunton-Ray & Greenwood	Ivanpah	Ivanpah
Shasta County			
Afterthought	Jordan & Glennan	Redding	Redding
Hornet (Mattie Orebody)	The Mountain Copper Co., Ltd.	216 Pine St., San Francisco	Matheson

SMELTERS, CUSTOM MILLS, ORE AND METAL BUYERS

Reporting Purchase of California Metals Produced in 1945

Name	Address	Location of plant	Metals reported purchased
American Smelting & Ref. Co.	120 Broadway, New York, N. Y.	Garfield, Utah	Copper, Lead, Gold, Silver
American Smelting & Ref. Co.	120 Broadway, New York, N. Y.	Hayden, Arizona	Copper, Gold, Silver
American Smelting & Ref. Co.	120 Broadway, New York, N. Y.	Murray, Utah	Lead, Copper, Gold, Silver
American Smelting & Ref. Co.	405 Montgomery St., San Francisco	Selby, Cal.	Copper, Lead, Gold, Silver
American Smelting & Ref. Co.	120 Broadway, New York, N. Y.	Tacoma, Wash.	Copper, Lead, Gold, Silver
Anaconda Copper Mining Co.	25 Broadway, New York 4, N. Y.	Great Falls, Mont.	Copper, Lead, Zinc, Gold, Silver
C. L. Ach	1855 Industrial St., Los Angeles	Los Angeles	Tungsten
Bradley & Ekstrom	320 Market St., San Francisco	San Francisco	Chromite, Manganese, Iron
Coast Chemical Division F. W. Berk & Co., Inc.	Sharon Bldg., San Francisco	San Francisco	Quicksilver
International Smelting & Ref. Co.	Kearns Bldg., Salt Lake City, Utah	Toocle, Utah	Copper, Lead, Zinc, Gold, Silver
Kaiser Co., Inc.	P.O. Box 217, Fontana	Fontana	Iron Ore, Manganese Ore, Chromite
Mefford Chemical Co.	1026 Santa Fe, Los Angeles	Los Angeles	Quicksilver
Metals Reserve Co.	Washington, D. C.	Various stock piles	Chromite, Manganese Ore,
Pacific Vegetable Oil Co., Bernard T. Rocca	62 Townsend St., San Francisco	San Francisco	Quicksilver
Quicksilver Producers Ass'n, Irving Ballard, Sec'y	407 Sansome St., San Francisco	San Francisco	Quicksilver
Sullivan Mining Co.	Kellogg, Idaho	Silver King, Idaho	Copper, Lead, Zinc, Gold, Silver
U. S. Smelting, Refining & Mining Co.	Newhouse Bldg., Salt Lake City, Utah	Midvale, Utah	Copper, Lead, Zinc, Gold, Silver
Western Gold & Platinum Works	589 Bryant St., San Francisco	San Francisco	Platinum, Gold, Silver*
Wildberg Bros. Smelting & Ref. Co.	742 Market St., San Francisco	San Francisco	Platinum, Gold, Silver*

* Gold and silver in special high-grade ores only.

APPENDIX

PUBLIC RESOURCES CODE

An act to establish a Public Resources Code, thereby consolidating and revising the law relating to natural resources, the conservation, utilization, and supervision thereof, and matters incidental thereto, and to repeal certain acts and parts of acts specified herein.

Chapter 93 (Stats. 1939.)

The people of the State of California do enact as follows:

GENERAL PROVISIONS

1. This act shall be known as the Public Resources Code.

2. The provisions of this code, in so far as they are substantially the same as existing provisions relating to the same subject matter shall be construed as restatements and continuations thereof and not as new enactments.

3. All persons who, at the time this code goes into effect, hold office under any of the acts repealed by this code, which offices are continued by this code, continue to hold the same according to the former tenure thereof.

4. No action or proceeding commenced before this code takes effect, and no right accrued, is affected by the provisions of this code, but all procedure thereafter taken therein shall conform to the provisions of this code so far as possible.

5. Unless the context otherwise requires, the general provisions hereinafter set forth shall govern the construction of this code.

6. Division, part, chapter, article, and section headings contained herein shall not be deemed to govern, limit, modify or in any manner affect the scope, meaning, or intent of the provisions of any division, part, chapter, article, or section hereof.

7. Whenever, by the provisions of this code, an administrative power is granted to a public officer or a duty imposed upon such officer, the power may be exercised or the duty performed by a deputy of the officer or by a person authorized pursuant to law.

8. Writing includes any form of recorded message capable of comprehension by ordinary visual means. Whenever any notice, report, statement or record is required by this code, it shall be made in writing in the English language.

9. Whenever any reference is made to any portion of this code or of any other law of this State, such reference shall apply to all amendments and additions thereto now or hereafter made.

10. "Section" means a section of this code unless some other statute is specifically mentioned.

11. The present tense includes the past and future tenses; and the future the present.

12. The masculine gender includes the feminine and neuter.

13. The singular number includes the plural, and the plural the singular.

14. "County" includes "city and county."

15. "Shall" is mandatory and "may" is permissive.

16. "Oath" includes affirmation.

17. "Signature" or "subscription" includes mark when the signer or subscriber can not write, such signer's or subscriber's name being written near the mark by a witness who writes his own name near the signer's or subscriber's name; but a signature or subscription by mark can be acknowledged or can serve as a signature or subscription to a sworn statement only when two witnesses so sign their own names thereto.

18. If any provision of this code, or the application thereof to any person or circumstances, is held invalid the remainder of the code, and the application of its provisions to the other persons or circumstances, shall not be affected thereby.

DIVISION 1. THE DEPARTMENT OF NATURAL RESOURCES

501. There is in the State government a Department of Natural Resources. The department shall be conducted under the control of an executive officer known as the Director of Natural Resources. The director shall be appointed by and hold office at the pleasure of the Governor and shall receive a salary of six thousand dollars a year.

502. Except as in this division otherwise provided, the provisions of Article 2, Chapter 3, Title 1, Part 3 of the Political Code shall govern and apply to the conduct of the Department of Natural Resources in every respect the same as if such provisions were herein set forth at length, and wherever in that article the term "head of the department" or similar designation occurs, it shall for the purposes of this division mean the Director of Natural Resources.

503. For the purposes of administration the department shall be organized by the director, subject to the approval of the Governor, in such manner as he deems necessary properly to segregate and conduct the work of the department. The director may appoint, in accordance with the civil service and other provisions of law, such deputies, officers, and other expert and clerical assistants as may be necessary.

504. The work of the department shall be divided into at least four divisions, known as Division of Forestry, the Division of Parks, the Division of Fish and Game, and the Division of Mines.

505. The Division of Forestry shall be administered through a chief who shall be known as the State Forester. He shall be a technically trained forester, appointed by the director upon nomination by the State Board of Forestry. General policies for the guidance of the Division of Forestry shall be determined by a State Board of Forestry which shall consist of seven members appointed by and holding office at the pleasure of the Governor. Of the seven members one shall be familiar with the pine timber industry, one with the redwood industry, one with live stock industry, one with general agriculture, and one with the problems of water conservation.

506. The Division of Parks shall be administered through a chief who shall be appointed by the director upon nomination by the State Park Commission. General policies for the administration of the State park system shall be determined by the State Park Commission which shall consist of five members appointed by and holding office at the pleasure of the Governor.

507. The Division of Mines shall be administered through a chief who shall be known as the State Mineralogist. He shall be a technically trained mining engineer, appointed by the director upon nomination by the State Mining Board. General policies for the guidance of the Division of Mines shall be determined by a State Mining Board, which shall consist of five members appointed by and holding office at the pleasure of the Governor.

508. The Division of the Department of Natural Resources for the supervision of oil and gas shall be in charge of a chief, known as the State Oil and Gas Supervisor.

509. The salaries of the chiefs of the Divisions of Forestry and Parks shall be fixed by the director with the approval of the Governor. The director and the chief of each division, before entering upon his duties, shall execute and deliver to the State an official bond in the sum of twenty-five thousand dollars conditioned upon the faithful performance of his duties.

510. The members of the Board of Forestry and the State Park Commission shall serve without compensation, but shall be entitled to their actual necessary expenses incurred in the performance of their duties.

512. The Department of Natural Resources may expend the money in any appropriation or in any special fund in the State treasury made available by law for the administration of the statutes the administration of which is committed to the department, or for the use, support, or maintenance of any board, bureau, commission, department, office, or officer whose duties, powers, and functions have been transferred to and conferred upon the department. Such expenditures by the department shall be made in accordance with law in carrying out the purposes for which the appropriations were made or the special funds created.

513. The department shall have possession and control of all records, books, papers, offices, equipment, supplies, moneys, funds, appropriations, land and other

property, real or personal held for the benefit or use of all bodies, offices, and officers whose duties, powers, and functions have been transferred to and conferred upon the department.

514. Nothing in this code is intended to supersede, modify or change the effect of the enactment of section 373g of the Political Code, and wherever in this code reference is made to any officer or agency of the Department of Natural Resources, it is made in the sense and with the same legal effect as was attributable thereto in the statute whence derived and which would continue to be so attributable but for the adoption of this code.

DIVISION 2. MINES AND MINING

Chapter 1. Definitions

2001. Unless the context otherwise requires, the definitions hereinafter set forth shall govern the construction of Division 2 of this code.

2002. "Department" in reference to the government of this State, means the Department of Natural Resources.

2003. "Division" in reference to the government of this State, means the Division of Mines in the Department of Natural Resources.

2004. "Person" includes any individual, firm, association, corporation, or any other group or combination acting as a unit.

Chapter 2. The Division of Mines

2200. For the purposes of this chapter "mine" includes all mineral bearing properties of whatever kind or character, whether underground, quarry, pit, well, spring or other source from which any mineral substance is or may be obtained. "Mineral" for the purposes of this chapter includes all mineral products both metallic and nonmetallic, solid, liquid or gaseous, and mineral waters of whatever kind or character.

2201. The State Mineralogist shall employ competent geologists, field assistants, qualified specialists, and office employees when necessary in the execution of the plans and operations of the division under this chapter and shall fix their compensation.

2202. The State Mineralogist shall maintain offices, and a museum, library, and laboratory in San Francisco for the purposes provided in this chapter.

2203. The State Mineralogist shall make a biennial report to the Governor on or before the fifteenth day of September next preceding the regular session of the Legislature.

2204. The State Mineralogist may receive on behalf of this State, for the use and benefit of the division, gifts, bequests, devices, and legacies of real or other property and may use the same in accordance with the wishes of the donors. If no instructions are given by the donors, the State Mineralogist shall manage, use, and dispose of the gifts, bequests, and legacies for the best interests of the division and in such manner as he may deem proper.

2205. The State Mineralogist shall:

(a) Make, facilitate, and encourage special studies of the mineral resources and mineral industries of the State.

(b) Collect statistics concerning the occurrence and production of the economically important minerals and the methods pursued in making their valuable constituents available for commercial use.

(c) Make a collection of typical geological and mineralogical specimens, especially those of economic and commercial importance such collection constituting the museum of the division.

(d) Provide a library of books, reports, and drawings bearing upon the mineral industries, the sciences of mineralogy and geology, and the arts of mining and metallurgy, such library constituting the library of the division.

(e) Make a collection of models, drawings, and descriptions of the mechanical appliances used in mining and metallurgical processes.

(f) Preserve and so maintain such collections and library as to make them available for reference and examination, and open to public inspection at reasonable hours.

(g) Maintain, in effect, a bureau of information concerning the mineral industry of this State to consist of such collections and library, and arrange, classify, catalogue, and index the data therein contained, in a manner to make the information available to those desiring it.

(h) Issue from time to time such bulletins as he may deem advisable concerning the statistics and technology of the mineral industries of this State.

2206. The State Mineralogist may prepare a special collection of ores and minerals of California to be sent to or used at any world's fair or exposition in order to display the mineral wealth of the State.

2207. The owner, lessor, lessee, agent, manager, or other person in charge of any mine of whatever kind or character within the State shall forward to the State Mineralogist, upon his request, at his office, not later than the thirty-first day of March in each year, a detailed report upon forms which will be furnished showing the character of the mine, the number of men employed, the method of working the mine and the general condition thereof, and the total mineral production for the past year. He shall also furnish any additional information relative to such mine that the State Mineralogist may from time to time require for the proper discharge of his official duties. Any such person who fails to comply with the provisions of this section is guilty of a misdemeanor.*

2208. The State Mineralogist or a qualified assistant may at any time enter or examine any and all mines, quarries, wells, mills, reduction works, refining works, and other mineral properties or working plants in this State in order to gather data to comply with the provisions of this chapter.

2209. The State Mineralogist may fix a price upon and dispose of to the public all publications of the division, including reports, bulletins, maps, registers, or other publications. The price shall approximate the cost of publication and distribution. He may also furnish the publications of the division to public libraries without cost and may exchange publications with geological surveys, scientific societies, and other like bodies.

2210. All money received by the division from sales of publications issued by the division shall be deposited at least once each month in the State treasury to the credit of the Division of Mines revolving printing fund, which fund is continued in existence. This fund is appropriated for the use of the division, in addition to such other funds as may be appropriated for the printing and publishing of reports, bulletins, and maps issued by the division. The State Controller may require financial reports from the division or any officer thereof.

(Added by Stats. 1939, Ch. 96, as part of codification.)

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* Sec. 19 of the Penal Code of California provides: "Except in cases where a different punishment is prescribed by this code, every offense declared to be a misdemeanor is punishable by imprisonment in a county jail not exceeding six months, or by a fine not exceeding five hundred dollars, or both."

PUBLICATIONS OF THE DIVISION OF MINES

During the past sixty-seven years, in carrying out the provisions of the organic act creating the former California State Mining Bureau, there have been published many reports, bulletins and maps which go to make up a library of detailed information on the mineral industry of the State, a large part of which could not be duplicated from any other source.

One feature that has added to the popularity of the publications is that many of them have been distributed without cost to the public, and even the more elaborate ones have been sold at a price which barely covers the cost of printing.

Owing to the fact that funds for the advancing of the work of this department have usually been limited, the reports and bulletins mentioned are printed in limited editions many of which are now entirely exhausted.

Copies of such publications are available for reference, however, in the offices of the Division of Mines, in the Ferry Building, San Francisco 11; State Building, Los Angeles 12; 631 J Street, Sacramento 14; Redding; and Division of Oil and Gas at Santa Maria, Santa Paula, Taft, Bakersfield, Coalinga. They may also be found in many public, private and technical libraries in California and other states and foreign countries.

A catalog of all publications from 1880 to 1917, giving a synopsis of their contents, is issued as Bulletin No. 77.

Publications in stock may be obtained postpaid by addressing the San Francisco, Los Angeles or Sacramento offices and enclosing the requisite amount.

Remittances of stamps in an amount not to exceed 26 cents, currency or coin will be accepted at sender's risk. Payment is preferred in the form of money orders.

Money orders should be made payable to the Division of Mines.

Write for latest revised price list.

NOTE.—The Division of Mines frequently receives requests for some of the early Reports and Bulletins now out of print, and it will be appreciated if parties having such publications and wishing to dispose of them will advise this office.

REPORTS

Asterisks (**) indicate the publication is out of print.

	Price (including postage and sales tax)
**Report I of the State Mineralogist, 1880, 43 pp. Henry G. Hanks	----
**Report II of the State Mineralogist, 1882, 514 pp., 4 illustrations, 1 map. Henry G. Hanks	----
**Report III of the State Mineralogist, 1883, 111 pp., 21 illustrations. Henry G. Hanks	----
**Report IV of the State Mineralogist, 1884, 410 pp., 7 illustrations. Henry G. Hanks	----
**Report V of the State Mineralogist, 1885, 234 pp., 15 illustrations, 1 geological map. Henry G. Hanks	----
**Report VI of the State Mineralogist, Part 1, 1886, 145 pp., 3 illustrations, 1 map. Henry G. Hanks	----
Part II, 1887, 222 pp., 36 illustrations. William Irelan, Jr. Price $0.75, sales tax $0.02	$0.77
**Report VII of the State Mineralogist, 1887, 315 pp. William Irelan, Jr.	----
**Report VIII of the State Mineralogist, 1888, 948 pp., 122 illustrations. William Irelan, Jr.	----
Report IX of the State Mineralogist, 1889, 352 pp., 57 illustrations, 2 maps. William Irelan, Jr. Price $1.15, sales tax $0.03	1.18
**Report X of the State Mineralogist, 1890, 983 pp., 179 illustrations, 10 maps. William Irelan, Jr.	----
Report XI (First Biennial) of the State Mineralogist, for the two years ending September 15, 1892, 612 pp., 73 illustrations, 4 maps. William Irelan, Jr. Price $1.50, sales tax $0.04	1.54
**Report XII (Second Biennial) of the State Mineralogist, for the two years ending September 15, 1894, 541 pp., 101 illustrations, 5 maps. J. J. Crawford	----
**Report XIII (Third Biennial) of the State Mineralogist, for the two years ending September 15, 1896, 726 pp., 93 illustrations, 1 map. J. J. Crawford	----
Chapters of the State Mineralogist's Report XIV, Biennial Period, 1913-1914, Fletcher Hamilton:	
**Mines and Mineral Resources, Amador, Calaveras and Tuolumne Counties, 172 pp., paper	----
Mines and Mineral Resources, Colusa, Glenn, Lake, Marin, Napa, Solano, Sonoma and Yolo Counties, 208 pp., paper Price $0.50, sales tax $0.01	.51
Mines and Mineral Resources, Del Norte, Humboldt and Mendocino Counties, 59 pp., paper Price $0.35, sales tax $0.01	.36
Mines and Mineral Resources, Fresno, Kern, Kings, Madera, Mariposa, Merced, San Joaquin and Stanislaus Counties, 220 pp., paper Price $0.75, sales tax $0.02	.77
Mines and Mineral Resources of Imperial and San Diego Counties, 113 pp., paper Price $0.50, sales tax $0.01	.51
**Mines and Mineral Resources, Shasta, Siskiyou and Trinity Counties, 180 pp., paper	----
**Report XIV of the State Mineralogist, for the Biennial Period 1913-1914, Fletcher Hamilton, 1915: A General Report on the Mines and Mineral Resources of Amador, Calaveras, Tuolumne, Colusa, Glenn, Lake, Marin, Napa, Solano, Sonoma, Yolo, Del Norte, Humboldt, Mendocino, Fresno, Kern, Kings, Madera, Mariposa, Merced, San Joaquin, Stanislaus, San Diego, Imperial, Shasta, Siskiyou and Trinity Counties, 974 pp., 275 illustrations, cloth	----
Chapters of the State Mineralogist's Report XV, Biennial Period, 1915-1916, Fletcher Hamilton:	
**Mines and Mineral Resources, Alpine, Inyo and Mono Counties, 176 pp., paper	----
Mines and Mineral Resources, Butte, Lassen, Modoc, Sutter and Tehama Counties, 91 pp., paper Price $0.50, sales tax $0.01	.51
**Mines and Mineral Resources, El Dorado, Placer, Sacramento and Yuba Counties, 198 pp., paper	----

REPORTS—Continued

Asterisks (**) indicate the publication is out of print.

	Price (including postage and sales tax)
**Mines and Mineral Resources, Monterey, San Benito, San Luis Obispo, Santa Barbara and Ventura Counties, 183 pp., paper	----
**Mines and Mineral Resources, Los Angeles, Orange and Riverside Counties, 136 pp., paper	----
**Mines and Mineral Resources, San Bernardino and Tulare Counties, 186 pp., paper	----
**Report XV of the State Mineralogist, for the Biennial Period 1915-1916, Fletcher Hamilton, 1917: A General Report on the Mines and Mineral Resources of Alpine, Inyo, Mono, Butte, Lassen, Modoc, Sutter, Tehama, Placer, Sacramento, Yuba, Los Angeles, Orange, Riverside, San Benito, San Luis Obispo, Santa Barbara, Ventura, San Bernardino and Tulare Counties, 990 pp., 413 illustrations, cloth	----
Chapters of the State Mineralogist's Report XVI, Biennial Period, 1917-1918, Fletcher Hamilton:	
**Mines and Mineral Resources of Nevada County, 270 pp., paper	----
Mines and Mineral Resources of Plumas County, 188 pp., paper—Price $0.50, sales tax $0.01	$0.51
Mines and Mineral Resources of Sierra County, 144 pp., paper—Price $0.75, sales tax $0.02	.77
Report XVII of the State Mineralogist, 1920, 'Mining in California during 1920,' Fletcher Hamilton; 562 pp., 71 illustrations, cloth—Price $2.50, sales tax $0.06	2.56
Report XVIII of the State Mineralogist, 1922, 'Mining in California,' Fletcher Hamilton. Chapters published monthly beginning with January, 1922:	
**January, **February, **March, April, May, **June, July, August, September, October, November, December, 1922—Price each $0.30, sales tax $0.01	.31
Chapters of Report XIX of the State Mineralogist, 'Mining in California,' Fletcher Hamilton and Lloyd L. Root. January, February, March, September, 1923—Price each $0.30, sales tax $0.01	.31
Chapters of Report XX of the State Mineralogist, 'Mining in California,' Lloyd L. Root. Published quarterly. January, April, **July, October, 1924, per copy—Price each $0.30, sales tax $0.01	.31
Chapters of Report XXI of the State Mineralogist, 'Mining in California,' Lloyd L. Root. Published quarterly:	
January, 1925. Mines and Mineral Resources of Sacramento, Monterey and Orange Counties—Price $0.30, sales tax $0.01	.31
**April, 1925. Mines and Mineral Resources of Calaveras, Merced, San Joaquin, Stanislaus and Ventura Counties	----
**July, 1925. Mines and Mineral Resources of Del Norte, Humboldt and San Diego Counties	----
**October, 1925. Mines and Mineral Resources of Siskiyou, San Luis Obispo and Santa Barbara Counties	----
Chapters of Report XXII of the State Mineralogist, 'Mining in California,' Lloyd L. Root. Published quarterly:	
**January, 1926. Mines and Mineral Resources of Trinity and Santa Cruz Counties	----
**April, 1926. Mines and Mineral Resources of Shasta, San Benito and Imperial Counties	----
July, 1926. Mines and Mineral Resources of Marin and Sonoma Counties—Price $0.30, sales tax $0.01	.31
**October, 1926. Mines and Mineral Resources of El Dorado and Inyo Counties, also report on Minaret District, Madera County	----
Chapters of Report XXIII of the State Mineralogist, 'Mining in California,' Lloyd L. Root. Published quarterly:	
January, 1927. Mines and Mineral Resources of Contra Costa County; Santa Catalina Island—Price $0.30, sales tax $0.01	.31

REPORTS—Continued

Asterisks (**) indicate the publication is out of print. Price (including postage and sales tax)

April, 1927. Mines and Mineral Resources of Amador and Solano Counties
Price $0.30, sales tax $0.01 $0.31

**July, 1927. Mines and Mineral Resources of Placer and Los Angeles Counties ---------- --

October, 1927. Mines and Mineral Resources of Mono County----------
Price $0.30, sales tax $0.01 .31

Chapters of Report XXIV of the State Mineralogist, 'Mining in California,' Lloyd L. Root. Published quarterly:

January, 1928. Mines and Mineral Resources of Tuolumne County------
Price $0.30, sales tax $0.01 .31

**April, 1928. Mines and Mineral Resources of Mariposa County---------- ----

**July, 1928. Mines and Mineral Resources of Butte and Tehama Counties ----

October, 1928. Mines and Mineral Resources of Plumas and Madera Counties ----------Price $0.30, sales tax $0.01 .31

Chapters of Report XXV of the State Mineralogist, 'Mining in California,' Walter W. Bradley. Published quarterly:

**January, 1929. Mines and Mineral Resources of Lassen, Modoc and Kern Counties; also on Special Placer Machines---'---------- ----

**April, 1929. Mines and Mineral Resources of Sierra, Napa, San Francisco and San Mateo Counties---------- ----

July, 1929. Mines and Mineral Resources of Colusa, Fresno and Lake Counties ----------Price $0.30, sales tax $0.01 .31

October, 1929. Mines and Mineral Resources of Glenn, Alameda, Mendocino and Riverside Counties----------Price $0.30, sales tax $0.01 .31

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